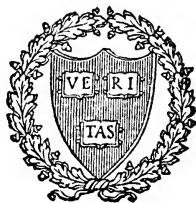


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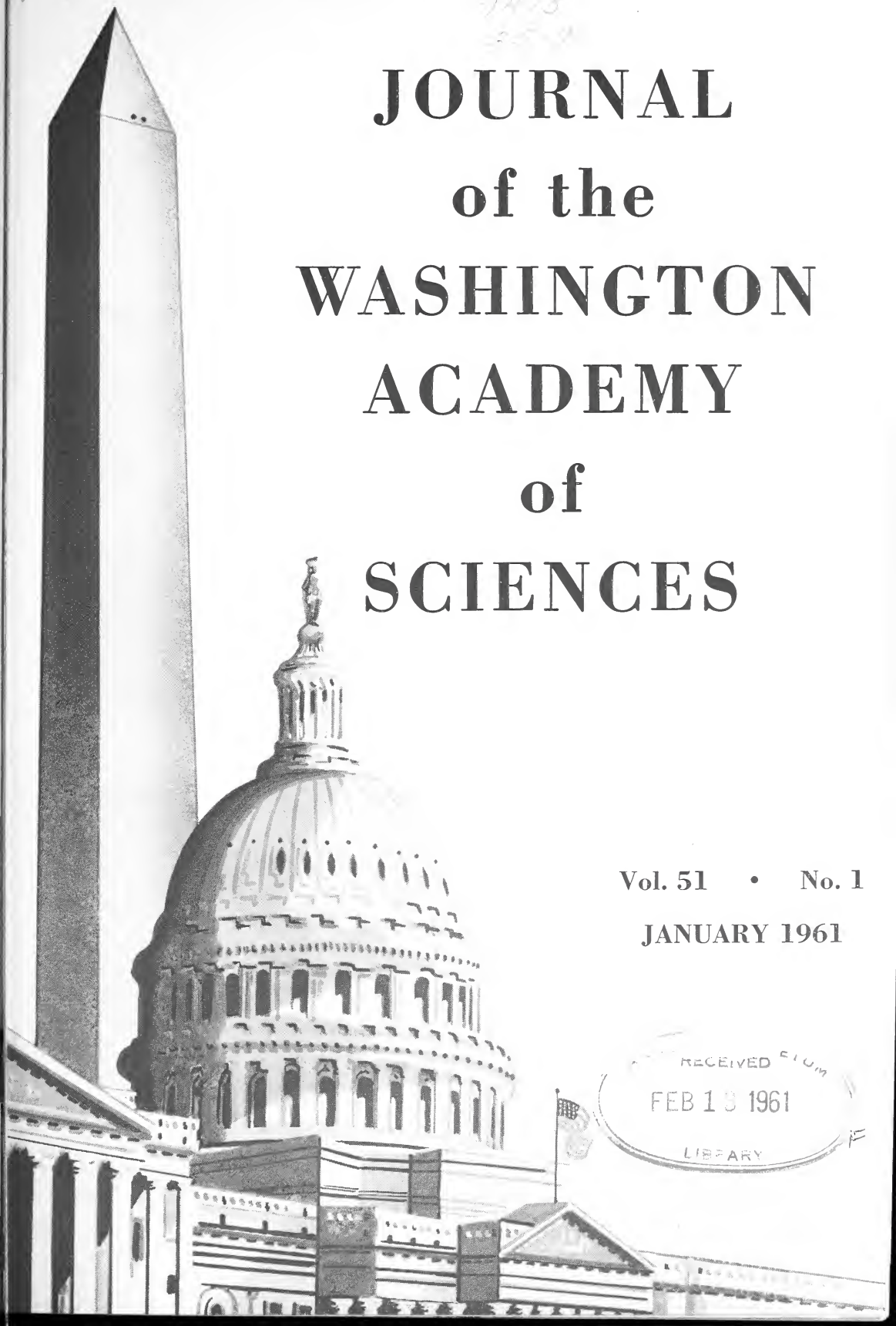
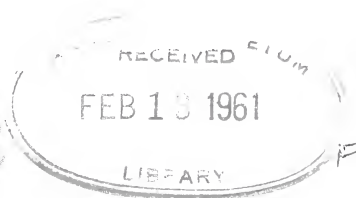


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# JOURNAL of the WASHINGTON ACADEMY of SCIENCES

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# JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

Editor: SAMUEL B. DETWILER, U. S. Dept. of Agriculture

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FRANK L. CAMPBELL, National Academy of Sciences  
RUSSELL B. STEVENS, Geo. Washington University  
JOHN K. TAYLOR, National Bureau of Standards

## Contributors

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MARGARET D. FOSTER, Geological Survey  
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This Journal, the official organ of the Washington Academy of Sciences, publishes: (1) historical articles, critical reviews, and scholarly scientific articles, (2) notices of meetings and proceedings of meetings of the Academy and its affiliated societies, and (3) regional news items, including personal news, of interest to the entire membership. The Journal appears eight times a year in January to May and October to December.

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# Philip Hauge Abelson

President, Washington Academy of Sciences, 1961

When Phil Abelson was elected in 1959 to the National Academy of Sciences, one of the highest honors that can come to an American scientist, he could have affiliated himself with any one of seven sections of the Academy, because he has made distinguished contributions to Biochemistry, Chemistry, Engineering, Geology, Geophysics, Microbiology, and Physics. Perhaps the presence of his friend Bill Rubey (Past President of the Washington Academy) in the Section on Geology caused Phil to register as a geologist. In *Who's Who in America* he calls himself a physical chemist, but the only proper designation for Phil Abelson is "scientist," for he has set no limit to his inquiries in natural science.

Phil is not unusual in his curiosity about natural phenomena; many of us are interested in all sciences from anthropology to zoology. Indeed, a function of the Washington Academy is to encourage broad interest in science and interdisciplinary connections and relationships among the recognized branches of science. Phil is unique, however, in his successful pursuit of knowledge through personal research in widely different fields. I used to think of the late Forest Ray Moulton as the modern Benjamin Franklin, but now I think that honor should go to Phil. Let us examine his remarkable career.

Phil was born in Tacoma, Washington, in 1913, a son of a civil engineer. In his early teens he learned to help his father in surveying and was soon able to do the work of a skilled surveyor. Opportunity and responsibility came when he was permitted to substitute for a surveyor who was absent from an important job because of illness. The boy made good and at 17 became Tacoma's City Surveyor. Thus he earned money to pay some of his expenses at Washington State University (then the State College of Washington). He majored in the physical sciences and graduated in three years when he was only 20. He remained in Pullman for two more years for a master's degree and served as an assistant in physics. During this period he became acquainted with the work of the late Ernest O. Lawrence at the University of California in Berkeley and decided to work for his Ph.D. in nuclear physics with Lawrence. His famous Radiation Laboratory was new at that time and so was the cyclotron. Phil was in on the ground floor of the great developments in nuclear physics. His doctor's dissertation (1939) described the first identification of many important products of uranium fission.

While at Berkeley Phil met and married a young medical student, who must have caused him to think about the biological effects of ionizing radiations. In 1939 he joined the staff of



the Carnegie Institution's Department of Terrestrial Magnetism here in Washington, a research institution that is not at all restricted to the study of terrestrial magnetism. He collaborated with Edwin M. McMillan, of the Radiation Laboratory, in the discovery of neptunium and in the determination of its chemical properties. These investigations suggested the early process used at Hanford for the manufacture of plutonium. During World War II he was, of course, a key figure in the Manhattan Project. Attached to the Naval Research Laboratory, he developed the liquid thermal diffusion method for the enrichment of uranium 235. Under his general supervision a plant employing that method was designed and constructed at Oak Ridge and incorporated into the over-all facility used in the production of the first atomic bomb. For this work he was awarded the Navy's Distinguished Civilian Service Medal. About two years ago there appeared in a local newspaper a feature story about Phil as the real father of our first nuclear-powered submarine, in the sense that he was the first to show how to use atomic energy for propulsion of undersea vessels. He won't talk about it, but he assured me that the story I read was substantially correct. Admiral Rickover, whose name is always associated with our atomic submarines, was the leader of the developmental phase of the work.



At the end of World War II we find Phil one of the atomic scientists who had helped to win the war for America. He had been well compensated and honored for his work. What would you expect him to do next? I would have expected him to advance to a position of greater authority in nuclear physics, and perhaps to promote the peaceful applications of atomic energy, which he must have foreseen. I would have expected him also to join in the public alarm sounded by the Atomic Scientists about the need for proper control of atomic energy. He did neither; instead he searched his own mind and conscience and quietly decided that he wanted to resume learning—to do basic research himself. Strange to say, he turned to biology where he could apply chemical and physical tools to the education of fundamental questions about living matter. The opportunity to do such work was provided by Merle A. Tuve, a member of the Washington Academy and of the National Academy, who had become Director of the Department of Terrestrial Magnetism of the Carnegie Institution. Thus Phil returned to the laboratory from which the war had taken him, rejecting greater salaries that he might have obtained elsewhere. He became Chairman of the Biophysics Section of the Department, which was a pioneer in the utilization of radioactive tracers in biological research. The group worked out many of the processes of synthesis of the principal amino acids and published a widely-used monograph on the subject. In 1950 while in this position Phil received the Annual Award of the Washington Academy of Sciences, in the Physical Sciences; in 1962 he will present this same award and others to young men and women whose research or teaching has been outstanding.

In 1953 Phil carried his biological interests into another laboratory of the Carnegie Institution. Appointed Director of the Geophysical Laboratory, he initiated investigations in what might be called biochemical evolution. Previously, comparative studies of plant and animal fossils had been only morphological. Phil saw the possibility of making chemical studies on traces of organic matter that he found, for example, in fossil shells. By paper chromatography he was able to isolate amino acids from fossils as old as 450 million years!

It would be natural for Director Abelson to succumb scientifically to the growing demands upon him as an administrator, a lecturer, a chairman or member of committees and editor. But he resists encroachment upon his time for thinking about his own research and for working at it with his own hands. Most recently he has been engaged with Thomas C. Hoering of his Laboratory in studying separation of carbon isotopes occurring during photosynthesis. By examining  $C^{13}/C^{12}$  in amino acids from organisms

grown in the laboratory they have discovered unexpected isotope fractionations. How can he do such research and also do more than his share as a citizen of the Washington scientific community? It takes a special environment, special ability and dedication, and an unusual design for living to be an Abelson. He literally lives with his work at his Laboratory and goes to his home in Philadelphia to spend week ends and holidays with his wife (a practising physician) and daughter. During the working week he is able to allocate his time so as to concentrate exclusively on his research for periods long enough for effective thought and action.

Phil's non-research activities for science are impressive. His work as co-editor of the *Journal of Geophysical Research* must be very time consuming. I know that he has had much to do with the recent rapid growth of this highly technical journal, which is certainly the world's leading publication in its field. His interest in the medical sciences is not surprising if one knows that Mrs. Abelson is a physician. For eight years he served as chairman of an NAS-NRC committee on cataracts of the eye caused by ionizing radiations. On another committee he concerned himself with substances that might be used to expand the volume of usable blood plasma. From 1956 to 1959 he was a member of the Biophysical Study Section of the National Institutes of Health and now serves on the Board of Scientific Counselors of the National Institute of Arthritis and Metabolic Diseases. On the physical side, he is a member of the General Advisory Committee of the Atomic Energy Commission and a member of its Plowshare Advisory Committee, i.e., on peaceful applications of atomic explosions, such as were described to the Washington Academy by Dr. Edward Teller at a meeting of the Academy in 1959. He is a consultant to the National Aeronautics and Space Agency. His membership in a dozen or so major scientific societies also reflects the extraordinary diversity of his interest. His preparation for service as President of the Washington Academy includes not only the above experiences in the content and civics of science, but experiences in the affairs of the Academy itself. In 1957 he served as chairman of the Meetings Committee under Bill Rubey. As an elected member of the Board of Managers he was a faithful attendant at the monthly Board meetings and a participant in its deliberations. It was he who set in motion the chain of events that led to a radical change in character of the *Journal of the Academy*, a revolution that is now becoming an evolution.

Phil is a quiet, thoughtful person, with whom one cannot become quickly acquainted. Certainly I do not know my subject as well as I should like to and probably not well enough for writing a profile that does him justice. I hope, however,

that my readers believe, as I do, that the Washington Academy is very fortunate to have acquired a share of his time. When he was elected a member of the Cosmos Club in 1953, his principal sponsors were two prominent physical scientists, Vannever Bush and L. R. Hafstad. The latter described Phil as a "most able scientist,

possessing an exceptional originality, with many outstanding scientific accomplishments to his credit." Withal Phil is a modest, charming fellow with a flashing smile. I expect his "exceptional originality" to be applied to the Academy gently but effectively. **Frank L. Campbell**

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column will present brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors are being assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves, and their friends. Contributions may be addressed to **Harold T. Cook, Associate Editor, U. S. Department of Agriculture, Agricultural Marketing Service, Room 3917 South Building, Washington 25, D. C.***

### CARNEGIE INSTITUTION

**H. W. Wells**, Department of Terrestrial Magnetism, Carnegie Institution of Washington, is on leave of absence to serve at the U. S. Embassy, Rio de Janeiro, as Scientific Attache.

### DAVID TAYLOR MODEL BASIN

**Harry Polachek**, Technical Director of the Applied Mathematics Laboratory at the David Taylor Model Basin, received the Distinguished Civilian Service Award on November 23. This honorary award, the highest that the Secretary of the Navy may confer on a civilian employee of the Navy, was given in recognition of Dr. Polachek's achievements in organizing and directing the Applied Mathematics Laboratory, in demonstrating the potential of high speed computers and in his contributions to scientific, technical and management fields such as nuclear design, advance programming systems, and analysis of acoustic signals. This has opened additional lines of research such as the automatic computation of ship lines and speeded the solution of a variety of problems and data reduction.

### GEOLOGICAL SURVEY

**Edwin W. Roedder** gave a paper on "Primary fluid inclusions in sphalerite crystals from the OH vein, Creede, Colorado," and **Margaret D. Foster** gave a paper on " $\text{Fe}_2\text{O}_3$  in chlorites" at the meeting of the Geological Society of America and affiliated societies, Denver, Colorado, October 31 to November 2. **Arthur A. Baker, Helen M. Duncan, Joseph J. Fahey, George T. Faust, Jewell J. Glass and Marjorie Hooker** also attended the meetings. At these meetings Miss Marjorie Hooker was re-elected Treasurer of the Mineralogical Society of America and Dr. George T. Faust was re-elected Treasurer of the Geochemical Society.

**Francis R. Fosberg** has returned from a two months' trip to the Pacific, during which he participated in a symposium on "The Impact of early man on humid tropical vegetation," held under the auspices of Unesco at Goroka, in the interior of New Guinea. While in New Guinea, Dr. Fosberg made a study of the vegetation patterns and visited an island of the Great Barrier Reef on the Queensland coast. In company with C. G. Johnson, of the Military Geology Branch, D. I. Blumenstock, of the Weather Bureau, and Harald Rehder, of the National Museum, he also visited Jaluit Atoll, in the Marshall Islands, to study the course of recovery of the atoll from the effects of the 1958 typhoon Ophelia.

### HOWARD UNIVERSITY

**Lloyd N. Ferguson** recently made talks on "The Direction of Enolization of 1,3-Diketones" at the University of Vermont; "Group Electronegativities in Organic Chemistry" at Norwich University; "Physicochemical Studies on the Sense of Taste" at St. Michael's College, "Multiple Careers for College Science Majors" and "Aromatic Character of Certain Ring Structures" at Middlebury College, under the ACS Visiting Scientists Program.

## NATIONAL ACADEMY OF SCIENCES

**Frank L. Campbell** served as deputy foreman of the November District of Columbia Grand Jury from November 7, 1960 to January 10, 1961.

## NATIONAL BUREAU OF STANDARDS

**Arnold M. Bass** is in London on a research assignment under the NBS training program. He is working with Dr. W. R. S. Garton in the Physics Department, Imperial College of Science and Technology, University of London until July 1961. Dr. Bass is working on vacuum ultraviolet spectra of diatomic molecules.

Academy members presenting papers at recent meetings included the following: **Alexander, S. N.**, "What's Ahead in ADP Equipment", American University, Institute on Electronics in Management, Washington, D. C., October 31; **Bennett, J. A.**, "What the Metallurgist is Doing About Fatigue," Washington Chapter, American Society for Metals, Washington, D. C., November 14; **Cook, R. K.**, and **Young, J. M.**, "Strange Sounds at Low Frequencies in the Atmosphere", Physics Seminar, University of Maryland, College Park, Maryland, November 8; **Cook, R. K.**, "Methods for Measuring Sound Transmission Loss", American Society for Testing Materials Symposium on Testing, Washington, D. C., November 15; **Frederikse, H. P. R.**, "Conduction in Rutile," Solid State Physics Group, Westinghouse Research Laboratories, Pittsburgh, Pennsylvania, November 7; **Harris, F. K.**, "The present Status of the Electrical Standards," American Institute of Electrical Engineers, New Haven, Connecticut, November 15; **Herzfeld, C. M.**, "Peaceful Uses of Atomic Energy," Institute for Religions and Social Studies, New York, N.Y., November 22; **McNish, A. G.**, "International Coordination of Standards," 1960 Middle Atlantic Conference for American Society for Quality Control, the Martin Company, Baltimore, Md., November 11; **McPherson, A. T.**, "Precision Measurement and National Security," Cumberland Section, American Society for Quality Control, Cumberland, Md., November 1; **Paffenbarger, G. C.**, "Denture Base Resins: Changes in Dimensions During Processing and in Service," Mid-Continental Dental Congress, St. Louis, Mo., October 30; **Posner, A. S.**, "Three Dimensional Chemistry," American Chemical Society Student Affiliate, University of Maryland, College Park, Md., November 16; **Rubin, R. J.**, "Classical Energy Transport in Disordered Lattices," American Physical Society, Chicago, Ill., November 25-26; **Scribner, B. F.**, "Spectroscopic Trace Analysis," Eastern Analytical Symposium, New York, N. Y., November 3; **Sweeney, W. T.**, "Properties of Resins Used in Dentistry," U. S. Army Central Dental Laboratory Commanders Conference, Washington, D. C., November 14-16; **Taylor, L. S.**, "Attending the meetings of the

International Atomic Energy Agency on Basic Safety Standards of Radiation," Vienna, Austria, October 31-November 4; **Taylor, J. K.**, "Electro-analytical Chemistry", Chemistry Seminar, Kent State University, Kent, Ohio, November 2, and "High Precision Coulometric Titrations", Analytical Group, Cleveland Section, American Chemical Society, "Advancing the Profession of Chemistry" American Chemical Society, Dayton, Ohio, November 8, and "A Code of Ethics for Chemists," American Chemical Society, Philadelphia, Pennsylvania, November 17; **Youden, W. J.**, "What Happens When Different Laboratories Evaluate the Same Item?", Binghamton Section of the American Society for Quality Control, Binghamton, New York, November 14.

## NAVAL RESEARCH LABORATORY

**George R. Irwin** and **J. A. Kies** presented a paper entitled "Review of Fracture Toughness Measurements" at the Twentieth Meeting of the ANC-5 Panel on MIL-HDBK-5 Strength of Metal Aircraft Elements, in Los Angeles, California on November 15-17.

Dr. Irwin also gave a series of lectures on "Materials and Missiles for Spacecraft" at the University of California in Los Angeles, December 1-6.

**Horace M. Trent** and Betty E. Anderson compiled a "Glossary of Terms Commonly Used in Acoustics." This pamphlet was prepared for the American Institute of Physics and is available from them on request.

Dr. Trent was one of seven panelists at a conference October 19 in San Francisco for science writers. This conference was sponsored by the American Institute of Physics with financial backing from the National Science Foundation. He spoke on "Mechanical Shock and Vibration."

He also gave lectures to high school science and mathematics teachers from the local area at the Naval Research Laboratory November 19 and 21.

## OFFICE OF NAVAL RESEARCH

**J. Samuel Smart** left the Physics Branch August 19 to take a position with the IBM Research Center, P.O. Box 218, Yorktown Heights, N. Y.

## USDA, BELTSVILLE

**R. I. Sailer**, until recently Assistant Chief of Insect Identification and Parasite Introduction Research Branch, of the Entomology Research Division, left on November 25 to take charge of the European Counterpest Laboratory, Paris, France. The Laboratory is headquarters for the Entomology Research Division Foreign Parasite Investigations. Discovery and introduction into the United States of parasites or predators that attack crop pests is the primary objective of the Laboratory.



**Paul W. Oman**, Chief, Insect Identification and Parasite Introduction Research Branch, Entomology Research Division, is serving as director of the U. S. Department of Agriculture, Far Eastern Regional Research Office in New Delhi, India, to develop and coordinate the agricultural research grant program in Asiatic countries conducted with PL 480 funds.

#### USDA, WASHINGTON

**Hazel K. Stiebeling** presented a paper on "Contributions of Insecticides to the American Home (including nutrition and Household Pests)" at a symposium on Contributions of Insecticides to Human Welfare, at the Entomological Society of America meeting in Atlantic City, November 28.

**Justus C. Ward** served on a panel on the Pesticide Residue Problem at the Eastern Branch of the Entomological Society of America meeting at New York City, October 14. On November 18, he spoke before the general session of the Oregon State Horticultural Society, Corvallis, Oregon, on "Historical Notes on Pesticide Controls," and before the Apple and Pear Section on "Pesticide Residues and Regulations."

**Elbert L. Little, Jr.**, U. S. Forest Service, attended the First Mexican Botanical Congress, in Mexico City, October 24-26.

#### UNCLASSIFIED

**Lloyd V. Berkner** has resigned as president of Associated Universities, Inc., New York, to accept the presidency of the Graduate Research Center, Dallas, Texas. Dr. Berkner has headed the Associated Universities, Inc., for the last 10 years.

#### DEATHS

**George Willis Stose** died January 30, 1960, after a long illness. He received the B.S. degree in civil engineering from Massachusetts Institute of Technology in 1893 and then spent 1 year in graduate work in geology. He joined the U.S. Geological Survey in 1894 and attained the rank of Chief Scientist (Geologist). Dr. Stose was retired in 1941 at the age of 72 years, his employment having been extended 2 years by Presidential order. He was called back to make wartime studies of manganese deposits in Alabama and Virginia from July 1949 to February 1953. For 44 years he was Editor of Geologic Maps, in charge of the Section of Geologic Maps. The geologic map of the United States printed in 1932 was compiled under his direction. Dr. Stose's own field studies were devoted largely to the geology of the Appalachians. His bibliography contains over 100 publications.

#### AFFILIATED SOCIETIES

##### **American Institute of Electrical Engineers, Washington Section**

Considerable progress is reported in organizing five technical groups or division within the Section, in the areas of: instrumentation and telemetry; communications; transportation, industry and management; power; and science and electronics. At least one of these divisions has held two meetings already, and others are planned.

##### **American Society of Civil Engineers, National Capital Section**

Annual Fall Awards to Outstanding Students were made, on December 13, to Howard T. Hill, George Washington Univ., Christopher L. Martin, Howard University, and Michael A. Czachor, Catholic University.

##### **American Society of Mechanical Engineers, Washington Section**

Mechanical engineering education for the remainder of the Twentieth Century was appraised by Paul F. Chenea, of Purdue University, at the December 8 meeting. This analysis tried, as so many are doing, to examine whether changes in curricula are needed, the relation of schools to industry, and the interplay of teaching duties and research effort.

##### **Chemical Society of Washington**

Principal business at the November 29 meeting of the board of managers concerned how best to arouse and continue member interest, a problem earlier studied by an *ad hoc* committee of the board. It was generally considered unwise to hold business sessions at regular meetings featuring outside speakers, but that much might be accomplished by inviting members to attend Board meetings, by opening committee meetings to the membership at large, by establishing additional committees with the avowed objective of furthering entertainment, organizing special events, and extending welcome to new and transfer members. A possible way to accommodate members' interests in specialized areas of chemistry would be to form topical groups or subsections within the society.

##### **Geological Society of Washington**

In addition to the regular program at the November 9 meeting, Frank C. Whitmore, Jr. discussed the discovery of an upper Miocene whale near Hampton, Va., perhaps the finest fossil of its kind that has thus far been found on the Atlantic Coastal Plain. It is also of special interest because, previously, whales of this type were thought to be of Pliocene age.

##### **Philosophical Society of Washington**

The Ninth Annual Christmas Lectures this year presented George W. Beadle, of the California Institute of Technology, on the general topic "Genes as Living Molecules." These lectures are primarily for high school and advanced junior

high school students, who are admitted free upon presentation of tickets distributed by the Society.

## CALENDAR OF EVENTS

Beginning with this issue, meetings of affiliated societies scheduled for the month of publication of the *Journal* will be noted chronologically. When available to us at the time of writing, the nature of the program, the place, and the time will be noted. Entries which do not include all of this information indicate, in most instances, a regularly scheduled meeting of the society—unless our correspondents notify us to the contrary, we assume that the date and location of such meetings remain unchanged from month to month. Every attempt will be made during 1961 to have the *Journal* appear at the beginning of each month. (January excepted).

**January 16—Acoustical Society of America, Washington, D.C. Chapter**  
Gallaudet College, 8:00 PM

**Society of American Military Engineers, Washington Post**  
YWCA, 17th and K, N.W., 12:15 PM

**January 18—Insecticide Society of Washington**  
Symons Hall, University of Maryland, 8:00 PM

**Washington Society of Engineers**  
John Wesley Powell Auditorium, 22nd and Mass. Ave., N.W., 8:00 PM

**January 19—Washington Academy of Sciences**  
John Wesley Powell Auditorium, 22nd and Mass. Ave., N.W.  
Banquet and presentation of Academy Awards.

**Society of American Foresters, Washington Section**  
YWCA, 17th and K, N.W., 6:30 PM

**January 24—American Society of Civil Engineers, National Capital Section**  
YWCA, 17th and K, N.W., 12:00 noon

**Society of American Bacteriologists, Washington Branch**  
Walter Reed Army Medical Center

**January 26—American Society of Mechanical Engineers, Washington Section**  
John Coutinho, "Reliability," Pepco Auditorium, 10th and E, N.W., 8:00 PM

## ACADEMY ACTIVITIES

The 454th meeting of the Academy will be the Annual Dinner Meeting, held January 19, 1960 at the John Wesley Powell Auditorium. Awards for Scientific Achievement will be presented by the President to the following recipients:

1. *Biological Sciences.* **Louis S. Baron**, Walter Reed Army Institute of Research.
2. *Engineering Sciences.* **Ronald E. Bowles**, Diamond Ordnance Fuse Laboratory.
3. *Physical Sciences.* **Richard A. Ferrell**, University of Maryland.
4. *Mathematics.* **Philip J. Davis**, National Bureau of Standards.
5. *Teaching—High School Science.* **Mrs. Pauline Diamond**, Sherwood High School.
6. *Teaching—College and University Science.* **Karl F. Herzfeld**, Catholic University.

A full-length feature on the Awards program and the recipients will appear in the February issue of the *Journal*.

## CORRECTION

Figures from the Treasurer's reports of Academy receipts and disbursements as printed on page 16 of the November 1960 issue of the *Journal* show larger totals for the year to June than to September.

This is because the author inadvertently included the totals for the Junior Academy of Sciences in the earlier report. Correct totals for January-June are: receipts, \$9,605; disbursements, \$8,850.

## THE BROWNSTONE TOWER

FRANK L. CAPBELL

Looking south down the Potomac from the Brownstone Tower, one might with the help of a telescope locate the Engineer Research and Development Laboratories of the U. S. Army Corps of Engineers at Ft. Belvoir, Va. Just prior to writing this column, I drove down to the ERDL to see



Clyde S. Barnhart, who is the entomologist in the Sanitary Sciences Branch (Richard P. Schmitt, in charge) of these Laboratories. He is responsible to W. Doyle Reed, an active member of the Washington Academy, for the development of equipment for pest control (rodents, insects, etc.) in the armed services, for the Corps of Engineers does this work for the Navy and Air Force as well as for the Army.

Dr. Barnhart was one of my students at the Ohio State University prior to World War II. He showed unusual imagination and proficiency in devising and constructing equipment for the rearing of insects and for experimentation with

them. Both the second world war and the Korean war so interfered with his career that he did not take his doctor's degree in entomology until 1958. Admittedly a Ph.D. was not necessary for engineering research, but he was determined to show that he could take his degree in insect morphology, and at last the time came when he was ready for placement in a position where his engineering talents could be given full sway.

What I now have to say about the work of Dr. Barnhart, whom I shall call Barney hereafter, will serve a dual purpose: (1) to inform the members of the Academy about some interesting work that might not otherwise come to their attention, and (2) to provide for the Membership Committee information about Barney that I hope will cause him to be elected to the Academy.

Soon after he came to ERDL, Barney concluded that the current pest control equipment was heavier and more expensive than was necessary. In view of the probability that future military operations will be air borne, it is really important that everything used by the military should be as light in weight as possible. Therefore he began to think about how to lighten and simplify the existing equipment.

First, he worked on a mosquito light trap, a device for attracting mosquitoes to an electric light and drawing them into a trap below by means of a downward current of air. The existing trap was large, heavy, and had to be hooked up to an electric outlet in order to operate it. Barney designed and built a smaller cylindrical trap of plastic materials and used dry batteries to operate the light and a motor that spins a toy propeller. The final product was not impressive in appearance, but extensive field tests have shown that it is promising, improvable, and usable everywhere.

Then Barney turned his attention to the rodent bait station, a heavy metal housing for poison bait attractive to rats. After these metal containers are used they have to be cleaned before they can be used again. Barney went to work with scissors and cardboard and cut out a pattern that could be folded into the shape of a very small dog house. The rat either enters the box to feed on the bait or it feeds with its head in the entrance. When such a simple inexpensive device becomes contaminated and is no longer attractive, it is simply destroyed by burning. Again, field tests have demonstrated that this cardboard shelter is just as effective as the old sheet metal containers.

I shall not mention everything that Barney has done along this line, but I do want to describe his centrifugal sprayer, which uses a principle not hitherto employed in commercial sprayers. The spray liquid is drawn or pumped through the hollow shaft of a motor and is thrown out through plastic tubing attached at right angles to the end of the rotating shaft.

This sprayer is in process of development and will be designed so that the whole unit on a pedestal can be clamped to the rear end of an army vehicle and will deliver a mist of concentrated spray that will be carried away from the vehicle as it moves forward. Weight is reduced to a minimum and the operation is relatively quiet.

Although this device is easily transportable and can be attached to any military vehicle for use wherever the vehicle can move, Barney sensed the need for something even simpler that can be carried by the individual soldier and used by him not only to produce a space spray for control of flying insects, such as mosquitoes, but also for the control of insects for which a so-called residual spray is required. In response to this need Barney created what I like to call the Whippersnapper, of the most elegant simplicity. The soldier carries in his hand or suspended from his shoulder a plastic bottle or bag containing a liquid insecticide. A long flexible plastic tube from container ends in a tiny brass nozzle. To deliver spray that will drift down wind all the soldier has to do is whip the plastic tube around by hand, as a cowboy whirls a rope, but in a vertical plane. It is helpful to have an enlargement as a handle about a third of the way along the tube. It occurred to Barney that this enlargement might serve another purpose. If one wants to spray, it gives simply a convenient hand hold on the tube. But if one wishes to deposit on a surface a layer of insecticide by means of a coarse spray, the plastic holder then becomes a pump which when squeezed repeatedly forces a coarse spray out of the nozzle. This pump has one-way valves at either end and is used in hospitals for pumping blood. The Whippersnapper, Barney tells me, has attracted most favorable attention from military officers.

Barney could have concentrated on pest control equipment to the exclusion of everything else going on around him, but he could not help being aware of the need for extension of his "light weight line" into the field of desalination and water purification, and he was encouraged to spend part of his time along these lines. The result is that he has moved into a very important and active field of research headed in Government by the Office of Saline Waters of the U. S. Department of the Interior.

He started his work on the assumption that if the evaporating surface was brought very close to the condensing surface the efficiency of distillation would be improved. He has not been concerned at all with stills as we know them in a chemical laboratory but rather with the obtaining of a condensate on a surface at a lower temperature than that of the evaporating surface, which he separates from the condensing surface by means of a water-repelling plastic window

screen. A rotating device on this principle was built and worked very well, but again Barney thought that it was more important from the military point of view to work first on a device for the use of individual soldiers, sailors, or air-men than to develop a machine for the production of fresh water in large quantities from salt water. Therefore I shall describe here only a very simple arrangement for the production of small quantities of fresh water from seawater. Let us suppose that men are adrift at sea under a rainless sky without drinking water. Each man could spend his time getting drinking water from Barney's solar still, which looks superficially like a file of correspondence having a minimum of five sheets. The top sheet consists of black plastic film; the second, a piece of paper toweling or cloth; the third, a water-repellent screen, or netting; the fourth, a piece of aluminum foil; and the fifth a cloth backing for the foil to cool it by evaporation of water from the cloth. The castaway dips all these sheets in the ocean, thus saturating the paper toweling and cloth with sea water. Then he drains off excess water, wipes off the aluminum foil with his shirt, and exposes the top black surface to the sun. In a little while he opens these layers, exposing the aluminum surface upon which there will be a condensate of fresh water. This he can mop up with a sponge to be provided in the kit and obtain water from the sponge.

Barney finds that the efficiency of this device can be multiplied by replication of layers two, three, and four mentioned above, and I myself saw the operation of a multilayered pile in which the three intermediate layers were repeated six times. On each of the aluminum layers a condensate was formed, diminishing in quantity as one proceeds from the top aluminum surface to the layers below. This survival still can be operated when the sun is not shining or at night merely by sitting on the black surface, thus providing a temperature differential between the top surface warmed by the body and the aluminum surfaces cooled by the sea water. Thus, as Barney expresses it, the output of the still will be proportional to the human effort put into it, and certainly a man who wants nothing so much as water will be glad to put a lot of effort into it.

There is in the embryo stage another solar still that will require little attention. It will be a variation of the so-called greenhouse still. A bell jar without a knob on top will be covered by an aluminum layer and the aluminum in turn by a black cloth or wick, which will pick up saline water from a circular trough below. This wet surface will be covered by a larger transparent bell jar the inside surface of which will be close to but not in contact with the wick. The double bell will be placed in direct sunlight, which will shine through the outer jar and will heat the cloth and aluminum under it. The heat will be con-

ducted by the aluminum around to the shady side of the bell. Then there will be a considerable temperature difference between the warm wet surface and the cooler glass jar surrounding it. Most of the condensate will form on the inside of the glass jar away from the sun. Because of its shape, this device need not be oriented toward the sun, but will work unattended wherever it is exposed to sunshine. Suitable arrangements will be made, of course, to collect the condensate.

All the above-mentioned developments have been protected by patent applications.

It was very interesting to me to see how Barney has reduced to practice the ideas that have come to him in such profusion. He has help, of course, but at first in the heat of imagination he works with his own hands and uses whatever he can and that he might adapt to his purpose. Thus his prototypes look very crude indeed, but in the end the armed services and the civilian population will benefit greatly by his work.

## SCIENCE AND DEVELOPMENT

**A newly developed soil psychrometer will aid scientists in accurately measuring the relative humidity of air in the soil.** The new instrument was designed by Dr. Lorenzo A. Richards and Dr. Gen Ogata at the U.S. Department of Agriculture Salinity Laboratory, Riverside, California. It is capable of measuring differences in relative humidity as small as 1/2000 of 1 percent. It will make possible quantitative measurements of soil moisture needed to determine the factors influencing availability of water to plants. Research has shown that most plants will grow if the relative humidity of air in the soil is between 98.91 and 99.83 percent, but not at 98.90 percent, although at this lower humidity most plants will remain alive.

**Bootlegging of amphetamine drugs** is a menace to safety on the Nation's highways, the Food and Drug Administration has asserted in a special report on its efforts to curb illegal sales of the stimulant pills to truck drivers and motorists. The FDA crackdown was launched last fall when it had more than 200 cases under investigation. Since that time, 85 criminal prosecutions have been completed; 31 additional prosecutions have been instituted and are now pending in Federal district courts; and in eight separate actions, 1,837,000 tablets and capsules of amphetamine drugs were seized. Defendants in the actions involved truck stop operators, grocers, and other peddlers; retail druggists who sold without prescription or refilled without authorization; and licensed practitioners who dispensed the drugs without having established a bona fide doctor-patient relationship.

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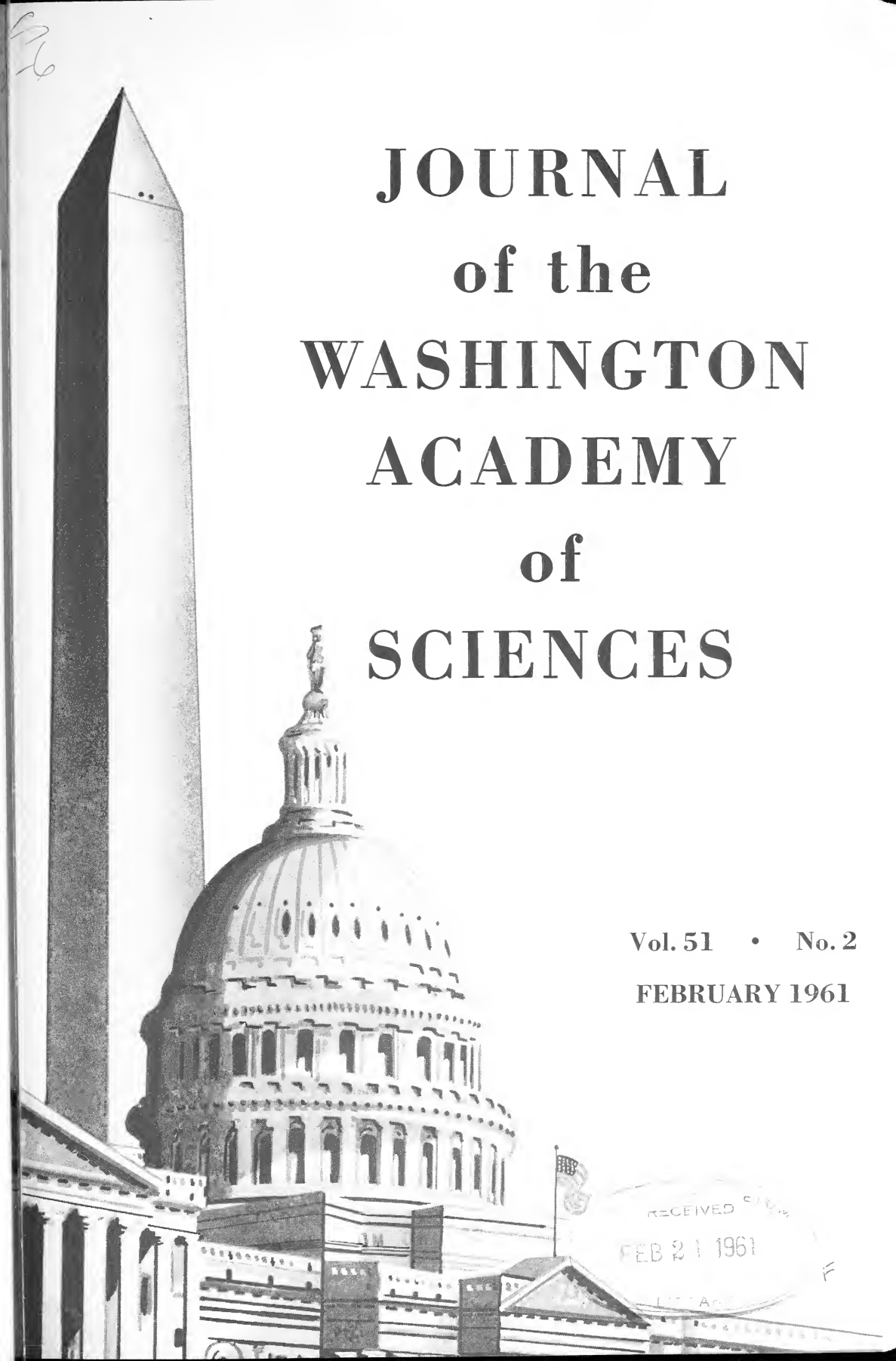
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JOHN K. TAYLOR, National Bureau of Standards

## Staff Assistant

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## Contributors

ALBERT M. STONE, Applied Physics Laboratory  
JOHN A. O'BRIEN, JR., Catholic University  
ELLIOTT B. ROBERTS, Coast & Geodetic Survey  
MARGARET D. FOSTER, Geological Survey  
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# The Academy in the Sixties

**Lawrence A. Wood**

*National Bureau of Standards*

Scientific activity in the Washington area, like that in the country as a whole, has undergone a tremendous expansion since 1940. Older governmental organizations employing scientists, like the Naval Research Laboratory and the National Bureau of Standards, have expanded appreciably while newly-established laboratories like the National Institutes of Health, the Naval Ordnance Laboratory, and the Department of Agriculture's Beltsville Research Center have entered the picture with staffs numbering in the thousands. Private organizations, said to be almost 150 in number, also conduct research and engage in development work. Most of them are quite small, but a dozen or more have staffs (including both technical and non-technical employees) numbering more than 300. Only about 10 percent of them were in existence in 1945.

The membership in the societies affiliated with the Washington Academy of Sciences has likewise grown apace. The Chemical Society of Washington alone now has more than 2400 members. I am not aware of any recent totalling of the membership figures for all 27 component societies, but it must be of the order of 10,000. The total number of people with a scientific or engineering background in the Washington area has been estimated to be about 20,000.

Thus one can readily see that there is an opportunity of considerable magnitude for a federation of societies to function in coordinating scientific activities along common lines. The Washington Academy of Sciences was organized in

1898 to serve this purpose.

Probably the most extensive cooperative program of this sort is handled by the Joint Board on Science Education, established in 1955 by the Academy and the D. C. Council of Engineering and Architectural Societies. The detailed activities of the Joint Board, as outlined in its 46-page directory, will probably surprise most members of the Academy by their variety and magnitude. The index lists the names of about 400 individuals who are participating in the various activities of the program. Another booklet, entitled "Visiting Scientists and Engineers," lists 181 topics for which speakers are available on request. A book, "Project Ideas for Young Scientists," contains over 400 suggestions for science projects. A monthly publication, *The Reporter*, is sent free to all the secondary school teachers of science and mathematics in the area, numbering about 1800.

The program has received national recognition, as shown by comments of college officials and by the many inquiries received from organizations in other parts of the country.

This work on the secondary school level might well be complemented by another program aimed at coordinating and improving scientific education on the university and graduate school level in the Washington area. The Academy is doing nothing in this field at present.

Another coordinating activity is the weekly compilation of a science calendar listing the meetings of scientific interest in the area; this likewise is conducted in

collaboration with the D. C. Council.

In addition to being a federation of societies, the Academy, as you all know, includes individual members — that is, “persons who by reason of original research or scientific attainment are deemed worthy of the honor of election.” The total number of individual members has grown from 531 in 1938 to about 1100 at the present time. This is certainly a far smaller proportion of the scientific workers in the area than was the case in 1938. It would be flattering to the present members to think that this represents more careful selection; but I fear that it merely represents lethargy on the part of the members in bringing in new candidates of high qualifications. In any case, it would seem that more activity along this line is highly desirable. Recognition of scientific attainment is certainly a worthwhile Academy function in which all its members can and should participate. The Academy’s annual awards for scientific achievement to scientists no older than 40 could well be made more substantial.

Like any other living organism, the Academy cannot afford to remain static. It must grow and change, adapting itself to new conditions and new needs. The establishment of an Academy office in 1958 and the alteration of the *Journal*, begun in 1959 and still continuing, represent the most important changes of the two years preceding 1960. The past year saw the adoption of revised bylaws and standing rules. I feel that they are all worthwhile accomplishments.

In the course of a year the Washington Academy of Sciences can teach much to any individual who is fortunate enough to be its president. One gains insight into some of its activities from continual reminders that new members must be appointed to its various committees and panels. One becomes acquainted with the multitude of scientific societies in the Washington area by contacts with their delegates in Academy Board meetings. One

receives intellectual stimulation from hearing the lectures at its general membership meetings. For all of this I am very grateful.

In return it seems only fitting that a president, on retiring into the state of innocuous desuetude characteristic of ex-presidents, should outline some specific respects in which he thinks the operations of the Academy might be improved.

The first recommendation I would make is to change the operating year of the Academy to begin on July 1, rather than in January. It would then correspond to the “academic year” of our educational system and to the “fiscal year” of our governmental agencies. The relatively inactive summer period could be used effectively by the new president in appointing committees, by the treasurer in drawing up a budget, by the *Journal* editor in making his plans, and by the Meetings Committee in selecting speakers. At present, these arrangements must be made in haste at the beginning of the calendar year.

The second recommendation would be for an increase of dues, with the major portion of the increase going towards the improvement of the *Journal*. A proposal of this sort in 1959 was favored by a majority of the members, but fell slightly short of the two-thirds vote required for amendments to the bylaws. Consequently, the *Journal* has been hampered by inadequate financial support.

The Academy organization at present makes no formal use of the services of its ex-presidents. Since a change in this situation could not be made before 1962, I can safely recommend it now without the possibility of incurring additional responsibilities myself. In general, it would seem that one who has been as familiar with the affairs of the Academy as a president is at the end of his term should be retained for a time in some formal way in the organizational scheme of the Academy.

The monthly meetings in the past few years have been addressed by some out-

standing speakers on a wide variety of topics. Attendance in the future should be improved by the better publicity made possible by a more definitely-scheduled *Journal*. There can be no doubt of the necessity of obtaining interesting, well-prepared speakers lecturing on topics of general interest. Topics dealing with interdisciplinary subjects, with international scientific relations, with the government's part in science, and with the history of science seem to me to be especially suitable types.

## Academy Presents Awards to Six

John K. Taylor

*National Bureau of Standards*

The Academy's 63rd Annual Meeting and Dinner, held on January 19, featured the presentation of awards for scientific achievement to six local scientists and educators.

The Academy awards program was initiated in 1939 to recognize young scientists in the local area for "noteworthy discovery, accomplishment, or publication" in the fields of biology, engineering, and the physical sciences. Awards for outstanding teaching were added in 1955, while mathematics was included for the first time in 1959.

The awards consist of scrolls engrossed with a citation. Beginning with the current year, they also include election to membership in the Academy with remission of dues for the first two years.

Award winners must be under 40 years of age in all cases except in teaching, for which no age limit is set. Nominations, obtained from Academy members and from local scientific institutions, are evaluated by committees composed of members of the Academy distinguished in the fields of science involved.

At the annual dinner, Archie I. Mahan, chairman of the Awards Committee, introduced the heads of the organizations

The very diversity of the Academy operations requires the cooperation of many individuals. Those who are participating in one activity should appreciate the extent and importance of the other activities. The federative activities, the honorary awards, the science education program, the monthly meetings, and the *Journal* all are important facets of the Washington Academy of Sciences as it enters the decade of the sixties.

represented by the award winners. These officials, in turn, commented upon the achievements of the candidates. Presentation of the awards was made by Lawrence A. Wood, president of the Academy during 1960, the award year.

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The award for biological sciences was made to Louis S. Baron of the Walter Reed Army Institute for Research. Dr. Baron did his undergraduate work at City College and his graduate work at the University of Illinois, from which he received the Ph.D. degree in 1951. He joined the staff of the Department of Immunology at Walter Reed and has been chief of that Department since 1956.

Dr. Baron's research activities have been concerned with various aspects of bacterial genetics, especially the relation of changes in antigenic and enzymatic composition. He was cited for "work on genetic recombination in different genera and tribes of bacteria."

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The award in the physical sciences was made to Richard A. Ferrell of the Physics Department, University of Maryland, who received his bachelor's degree at California Institute of Technology after an outstand-

## *Award Winners at Annual Academy Meeting*



L. S. BARON



R. E. BOWLES



P. J. DAVIS



PAULINE DIAMOND



R. A. FERRELL



K. F. HERZFELD

ing undergraduate record. His Ph.D. degree was obtained at Princeton University in 1952.

After an AEC postdoctoral fellowship, he joined the faculty of the University of Maryland and was elevated to professorial rank in 1959. He has also been a recent recipient of an NSF postdoctoral fellowship.

Dr. Ferrell has achieved international recognition in the field of theoretical physics. He was cited in particular for "contributions to the theory of collective effects in nuclei and solids."

Ronald E. Bowles of the Diamond Ordnance Fuze Laboratory received the award for scientific achievement in engineering. Dr. Bowles, a native of the local area, attended Roosevelt High School and the University of Maryland. Most of his professional career has been at DOFL, which he joined in 1954. While employed there, he attended the University of Maryland

graduate school part-time and received the Ph.D. degree in mechanical engineering in 1957. His present position at DOFL is that of a supervisory mechanical engineer.

Dr. Bowles has done extensive pioneering work in the theory and development of fluid amplifiers without moving parts, which promise to create a revolution in the field of automatic control. He was cited for "distinguished service in starting and leading research on pneumatic control devices without moving parts."

The award for mathematics was presented to Philip J. Davis of the National Bureau of Standards. Dr. Davis received the Ph.D. degree in mathematics from Harvard University in 1949. After a period of postdoctoral research at Harvard and a one-year period at American University, he joined the staff of NBS in 1953 and is now chief of the Numerical Analysis Section, Applied Mathematics Division.

Dr. Davis' chief research interest is in

the field of functional analysis. He was cited for "contributions to the theory of analytic functions and numerical analysis."

Presentation of the award for teaching college and university science was made to Karl F. Herzfeld of Catholic University. Born in Vienna, Dr. Herzfeld received the Ph.D. degree from the University of Vienna in 1914. During the period 1926 to 1936, he served on the faculty at Johns Hopkins University. He has been associated with Catholic University since 1936, where he is professor and head of the Physics Department.

Dr. Herzfeld, a member of the National Academy of Sciences, has had a distinguished career in physics including the fields of ultrasonics, quantum theory, and solid state physics. The present award, however, was for his outstanding teaching; the citation reads, "in recognition of his distinguished services as a teacher of

physics, and his lasting influence on the lives of his students."

Pauline Diamond, who teaches chemistry and physics at Sherwood High School, Sandy Spring, Md., received the award for outstanding teaching of high school science. After receiving the A.B. degree from Brooklyn College in 1940, Mrs. Diamond was employed during the war years at the National Bureau of Standards, where she conducted research in electrical measurements and in pH determinations. She is now in her sixth year of teaching at Sherwood.

Mrs. Diamond has taken an active interest in science education activities outside of the classroom, especially in matters concerned with science fairs in Montgomery County. Her citation reads, "in recognition of effectiveness as a teacher of chemistry and physics, resulting in the choice of careers in science by many of her students."

## Plant Disease Control Without Chemicals \*

Harold T. Cook

*Agricultural Marketing Service, U.S. Department of Agriculture*

The title may suggest that the subject of this paper was chosen because of the current interest in pesticidal residues and food additives resulting from the recent amendments to the Food, Drug and Cosmetic Act and the cranberry episode of last year. Actually, my interest in plant disease control without chemicals antedates the present furor over pesticidal residues by about 30 years.

Fungicides are useful and necessary for control of some plant diseases, but too often plant pathologists resort to them when other methods may be more effective, practical, and economical. Ever since

\* Address of the retiring president of the Botanical Society of Washington, December 1960.

the discovery of bordeaux mixture by Millardet in 1882, fungicides have played a major role in plant disease control. Their use has been accelerated in recent years by extensive commercial advertising and a vast army of salesmen.

Disillusionment about standard chemical treatments came early in my professional career. Soon after I became plant pathologist at the Virginia Truck Experiment Station in 1930, I was directed to revise the Station bulletin on sweet potato diseases. Since I had never seen a sweet potato except on the dinner table, I put my trust in recommendations in farmer's bulletins and experiment station bulletins. I recommended treating the seed potatoes



with bichloride of mercury and warned in boldface type how to handle the deadly poison. I recommended coating the bottom end of each sprout with copper or sulfur dust before planting. And finally, I recommended fumigating the storage house with formaldehyde or spraying the walls and floors with copper sulfate solution, whitewash, or lime-sulfur.

These were standard recommendations, but they didn't control disease in demonstration plots I planted to show farmers how to grow healthy sweet potatoes. Later I found why the chemical treatments didn't work, and developed non-chemical methods that were more effective and practical.

There are many advantages to non-chemical methods for controlling plant diseases:

1. They are often cheaper, since there is no cost for fungicidal materials and equipment and labor for applying them.
2. They are often more practical, since it is difficult or impossible to spray or dust at frequent and regular intervals.
3. Mechanical injury by sprayers and dust-ers is avoided.
4. Chemical injury by fungicides is avoided.
5. There are no unsightly or toxic residues.
6. Disease control is sometimes more complete.

The non-chemical methods for plant disease control are based on rather simple and basic principles:

1. Elimination of the microorganism that causes disease by hot water seed treatment, heat treatment of vegetative parts, growing seed in dry areas where the disease does not develop, propagation methods that remove diseased parts, and sanitation.
2. Preventing infection by avoiding injuries and promoting formation of natural barriers to infection.
3. Retarding infection and development of disease by refrigeration and controlled moisture.
4. Planned marketing so that products are used before spoilage occurs.
5. Use of disease-resistant varieties.

There are numerous examples of plant disease control by these methods. Some are so firmly established that they are taken for granted. Time will permit discussion of only a few.

Bean anthracnose was the most serious disease of beans in states east of the Mississippi until 1927. Numerous attempts to control it by chemical seed treatments and field sprays failed. Breeding for resistance was complicated by the existence of three strains of the fungus. The disease has been almost completely eliminated since 1927 simply by growing disease-free seed in the arid western states where the air is too dry for the fungus to develop on the seed pods and infect the seed. Previously, much of the bean seed was grown in Michigan and western New York, where the weather was often favorable for anthracnose.

Bacterial blight is another seed-borne disease of beans that is controlled by growing seed in western states, especially in certain parts of California. Numerous wet and dry chemical seed treatments were tested before this simple and effective control was found.

Black rot is an important disease of cabbage and related crops. For many years, treating the seed with bichloride of mercury was recommended, but only incomplete control was obtained. Research recently showed that some seed is internally infected so that chemical treatment could not be expected to be effective. Hot water seed treatment gave complete control, but was not practical for treating large volumes of seed. Fortunately, hot water seed treatment is no longer necessary because most of the seed is now grown in Pacific coast states where it does not become infected. Blackleg, another cabbage disease that was formerly important, also has been nearly eliminated by using western-grown seed.

Celery is sprayed weekly from the time the plants come up until it is harvested, to control the leaf blights. It is a costly and messy operation and does not control

blight satisfactorily in bad years. Much trimming and washing are necessary to remove spray residue before marketing. These celery diseases may be controlled and the need for spraying eliminated by treating the seed with hot water and crop rotation. Chemical seed treatments are only partly effective because the fungi are within the seed coat.

The effectiveness of hot water seed treatment was strikingly demonstrated in commercial plantings at Norfolk, Va., in 1941. Blight had caused heavy losses there in 1940. The next season, six of the nine growers accepted the Experiment Station offer to treat their seed. Blight destroyed the celery of the three growers whose seed was not treated. Four of the growers using treated seed had no blight. The other two had blight only in the beds where they used plants obtained from neighbors whose seed was not treated.

Hot water and hot air treatments of vegetative parts have been used to control virus diseases of peaches, cranberries, and sugar cane, red rot of sugar cane, and black rot of sweet potatoes.

Black rot is a major disease of sweet potatoes. Some may be found at harvest, but usually infection is not noticeable until several weeks later. Sweet potatoes that are washed before packing may be infected by spores in the wash water. Black rot that develops during transit may make the entire lot unsalable when it reaches the market.

Standard recommendations for black rot are to discard seed potatoes with black rot and to treat the remaining ones in bichloride of mercury. This treatment kills black rot spores on the surface but not the fungus in the spots. Spotted potatoes that escape detection and are bedded produce diseased sprouts and cause black rot in the next crop.

An easier and more effective way to control black rot is to cut the sprouts above the seed bed soil line instead of pulling them. Since black rot occurs only on the

underground stem, only the healthy part is planted. Sprout cuttings live and yield as well as field sprouts.

Scurf is another major sweet potato disease that may be easily eliminated by planting sprout cuttings. Chemical seed and sprout treatments that have been recommended have little effect on scurf.

Sanitation is an effective control measure and need not involve chemicals. Fumigation of sweet potato storage houses with formaldehyde is still recommended. It is an expensive and unpleasant task and I don't know of any experimental evidence to justify it. Thorough sweeping or washing down of the storage will probably do as much or more good.

Preventing infection is important in controlling many market diseases. Once the pathogen has entered the fruit or vegetable it is beyond reach of most fungicides.

Many years ago, U. S. Department of Agriculture workers showed that much decay in California oranges started at mechanical injuries that occurred during harvesting, packing, and shipping. Fruit with no apparent injury when packed had only 1.8 percent decay at destination in contrast to 26.9 percent in visibly injured fruit. Improved handling has markedly reduced decay in commercial shipments without the aid of chemicals.

Heating, chilling, and freezing may cause physiological changes and physical damage that are followed by decay. *Alternaria* decay of tomatoes, peppers, and acorn squash, and *penicillium* decay of sweet potatoes, are examples of decay that follows chilling injury. Unchilled tissues are not affected by these fungi, but decay develops rapidly after chilling. Chilling injury occurs in tomatoes and sweet potatoes below 55°F., and in acorn squash and peppers at 45° or lower. Chemical treatments give little if any protection. The logical remedy is to avoid exposure to conditions that cause such injury.

Formation of natural barriers in injured tissues prevents decay in potatoes and sweet

potatoes. These vegetables are unavoidably cut, broken, and skinned during harvesting, cleaning, and packing, but the injured tissues heal and wall out the decay pathogens in potatoes that are kept at 70°F. or higher in a humid atmosphere. These healing properties are utilized to prevent soft rot and browning of new potatoes during transit. Instead of using low temperatures to check decay, moderate temperatures are maintained in the rail cars so the injured tissues will heal. Healing also is used to reduce seed piece decay before and after planting. Chemical treatments are unnecessary and may interfere with healing and increase decay.

Curing sweet potatoes at 85°F. in a humid atmosphere after harvest gives excellent control of rhizopus rot. Recuring the potatoes after they are washed and packed for market is a promising method of reducing decay in transit and at the market.

Refrigeration controls many post-harvest diseases. But the amount of refrigeration that may be used depends on the fruit or vegetable. Some may be stored at 32°F. but others, like tomatoes, are injured and made more susceptible to decay by chilling temperatures considerably above freezing. The temperatures used must be tailored to the particular fruit or vegetable. Temperatures below 40° are safe for oranges and retard penicillium and stem end rots. Rhizopus causes no visible decay in peaches after six days at 45°, but 36° is necessary to retard brown rot an equal amount.

Recent research has shown that rhizopus decay in cannery peaches can be reduced from 4.7 percent to 0.5 percent simply by storing the fruit at 31°F. for 14 days before ripening instead of ripening immediately. Cannery get two or three more cases per ton when peaches are handled this way. Chemical treatments failed to give satisfactory decay control.

Humidity control is important for controlling disease. Aeration is a practical

method of reducing moldiness in stored grain. Fungicides are not effective, and if they were would leave undesirable residues. Prompt drying and maintenance of low humidity are especially important to prevent heavy losses from onion neck rot.

Free moisture favors decay of stored root crops. Crater rot, rhizopus, sclerotinia, and botrytis decays cause serious damage to carrots that are continuously wet by water dripping from overhead brine coils. Such decay has been almost completely eliminated in some storages simply by erecting a kraft paper awning over the carrots to shed the water.

Planned marketing based on the predicted keeping quality of different lots of fruits or vegetables reduces disease losses. Decay during storage varies in different lots of California grapes. More decay occurs in grapes from some vineyards than others, and in grapes harvested soon after rainy periods. The grapes that will have least decay in storage may be identified soon after harvest by placing samples of each lot under conditions that accelerate decay. This makes it possible to market lots that will decay badly if stored too long, while they are still in good condition. Some California grape producers have used this method as a marketing guide for several years. A similar method is being used to forecast bull's-eye rot in stored northwestern apples.

Plant disease control by use of disease-resistant varieties is well established. It is a very effective method, but many years are required to develop an assortment of desirable resistant varieties, and progress is frequently nullified by the appearance of new strains of the pathogenic fungi.

I have cited only a few examples of successful plant disease control without chemicals. There are many others. Many diseases now unsatisfactorily controlled by chemicals would probably respond to non-chemical methods.



# FEBRUARY MEETING

(455th Meeting of the Washington Academy of Sciences)

## ADDRESS OF THE RETIRING PRESIDENT

### SPEAKER

*Lawrence A. Wood, National Bureau of Standards*

### SUBJECT

*Unorthodoxy in Science*

### DATE

*Thursday, February 16, 1961, 8:15 p.m.*

### PLACE

*John Wesley Powell Auditorium, Cosmos Club, 2170 Florida Ave., N.W.*



**THE SPEAKER—**Lawrence A. Wood was born in Peekskill, N.Y., in 1904. He received the A.B. degree in chemistry and mathematics from Hamilton College in 1925. He then transferred for his graduate work to Cornell University,

where he changed his field of science to physics and received the Ph.D. degree in 1932. He remained at Cornell as an instructor in physics for three subsequent years, conducting research in the field of electricity, then came to the National Bureau of Standards in 1935 as a member of the Rubber Section. In 1943 he became chief of this Section, a position which he still holds.

Dr. Wood's scientific career was reviewed in the *Journal* for February, 1960. For his outstanding research achievements he received the Academy's 1943 award for achievement in the physical sciences. In 1958 he received a meritorious service award from the Department of Commerce for his valuable fundamental contributions to the science and technology of rubber.

Dr. Wood has always shown much interest in scientific societies, both locally and nationally. In addition to being a member and immediate past president of the Washington

Academy of Sciences, he is a member of the American Chemical Society, member and past president (in 1955) of the Philosophical Society of Washington, and a fellow of the American Physical Society. He was a founder of the APS Division of High Polymer Physics, and its chairman in 1947.

**ABSTRACT OF THE ADDRESS—**Some scientific concepts, when they are first proposed, are distinctly not in accord with the accepted ideas of their time. Later, some of them receive general recognition and are incorporated into the body of general scientific knowledge. It is instructive to study specific examples of unorthodoxy in science to see if there are distinguishing general characteristics which may be useful in predicting the probable fate of the concept. The human motives and personal factors involved in scientific activities must not be underestimated. Examples, drawn largely from the physical sciences, include, among others: Copernicus' concept of the solar system, Galileo's mechanics of falling bodies, Young's wave theory of light, the theory of conservation of energy, Pasteur's theories of bacterial action, Planck's quantum theory, N-rays, Ehrenhaft's sub-electrons and single magnet poles, Klingelfuss' computation of electrical constants, Rupp's artificial positrons and polarization of electron beams, para-psychology and extra-sensory perception, and the magneto-optical method of chemical analysis.

# Summary Annual Report of Treasurer for 1960

Washington Academy of Sciences

## Receipts

Dues .....	\$ 5,290.75
Life membership .....	25.00
Journal subscriptions and reprints .....	3,125.63
Sales of <i>Journal</i> back numbers .....	618.19
Sales of Monograph No. 1 and Index .....	19.30
Interest, dividends, and capital gains .....	3,673.12
Fiscal services to Joint Board on NSF grant administration .....	403.71
Unused portion of \$500 grant .....	79.04
Miscellaneous receipts (meetings, grants, gifts, etc.) .....	567.70
Total .....	<u>\$13,802.44</u>

## Expenditures

<i>Journal</i> (printing, mailing, etc., for 8 issues) .....	\$ 4,528.87
Routine operations, officers and meetings .....	2,254.35
Headquarters office expenses including Social Security .....	5,599.13
Directory .....	274.75
Custodian of Publications .....	422.42
Annual dinner .....	339.00
Grant, Joint Board on Science Education .....	500.00
Grant-in-aid, WAS Committee on Encouragement of Science Talent .....	300.00
Grants, reimbursable .....	100.85
AAAS academy conference .....	20.00
Science calendar .....	75.00
Certificates, Awards Committee .....	5.77
Debits, memos and refunds .....	17.22
Total .....	<u>\$14,437.36</u>

Excess disbursements over receipts \$634.92

## Summary of Cash Balances

	12/31/59	12/31/60	Decrease
Washington Academy of Sciences .....	\$ 6,321.82	\$ 5,686.90	\$ 634.92
Washington Junior Academy of Sciences .....	1,337.04	781.91	555.13
NSF grant administration (Joint Board) .....	21,737.08	19,856.38	1,880.70
Totals .....	<u>\$29,395.94</u>	<u>\$26,325.19</u>	<u>\$ 3,070.75</u>

## Summary of Receipts and Expenditures, 1960

	Receipts	Expenditures	R less E
Washington Academy of Sciences .....	\$13,802.44	\$14,437.36	— \$ 634.92
Washington Junior Academy of Sciences .....	4,140.50	1,695.63	— 555.13
NSF grant administration (Joint Board) .....	35,914.35	37,795.05	— 1,880.70
Totals .....	<u>\$53,857.29</u>	<u>\$56,928.04</u>	<u>\$3,070.75</u>

## Summary of Grant, National Science Foundation to WAS (Administered by Joint Board on Science Education)

Balance in WAS checking account on 12/31/59 .....	\$21,737.08
Additions to grant during 1960 .....	35,914.35
Total .....	<u>\$57,651.43</u>
Expended or returned to NSF during 1960 .....	<u>37,795.05</u>
Cash balance on 12/31/60 .....	<u>\$19,856.38</u>

## Summary of Assets

	Market Value		Change in
	12, 31 '59	12, 31 '60	1960
Washington Academy of Sciences			
Bonds & Mutual Shares .....	\$70,097.88	\$65,778.81	\$4,319.17
Cash balance .....	6,321.82	5,686.90	634.92
Totals .....	\$76,419.70	\$71,465.71	\$4,954.09
Washington Junior Academy of Sciences			
Savings account and interest .....	\$ 2,000.00	\$ 2,086.20	+ \$ 86.20
Cash balance .....	1,337.04	781.91	555.13
Totals .....	\$ 3,337.04	\$ 2,868.11	— \$ 468.93

—Carl L. Aslakson, Treasurer, 1960

## Summary Annual Report of Secretary for 1960

In order to summarize the activities more extensively reported by the various officers and chairmen of committees at the annual meeting, the Secretary has prepared the following facts regarding the Academy's vital statistics. As of the end of the calendar year 1960, the Academy had the following numbers of members in the respective categories:

<i>Resident</i>	<i>Nonresident</i>
Active .....775 (+16)	Active .....180 (—16)
Retired ..... 67 (+16)	Retired ..... 69 (+15)
Patron ..... 0	Patron ..... 0
Honorary ..... 0	Honorary ..... 6
Subtotal .....842	Subtotal .....255
Total membership .....	1,097 (+31)

The parenthetic figures show the net change over 1959. The Membership Committee inherited 15 nominations at the beginning of the year and made recommendations for 83 new memberships. Of the latter, 22 are still pending election by the Board and 61 have been so elected and invited to become members. A total of 66 new members have been brought into the Academy; but due to resignation and deaths our net gain in membership is only 31 as shown above.

Losses in membership reported in 1960 due to deaths are listed herewith with the date of deceased when known:

Arthur C. Baker (September 11, 1959); Harley H. Bartlett (February 13, 1960); Paul Bartsch (April 24, 1960); Peter Chrzanowski (April 14, 1960); Carroll E. Cox (June 24, 1960); Arthur L. Day (February 2, 1960); Howard A. Edson (February 29, 1960); Julia Gardner (November 15, 1960); Beno Gutenberg (January 25, 1960); Ernest L. Jackson (June 14, 1960); Frank C. Kracek (July 5, 1960); Leo Loeb (December 28, 1959); Paul Schureman (September 20, 1959); Joseph F. Siler; Paul K. Smith (October

6, 1960); George W. Stose (January 30, 1960).

During the academic year the meetings of the Academy heard Frank L. Campbell, retiring president, speak on "The Amateur and the Academy" — a plea for the recognition of those persons who through self-education and discipline have produced very fine research in fields out of their area of formal training. His lecture was illustrated by the work of two such amateurs—Walter C. O'Kane on "Tree Flowers," and Alvah Peterson on "Insect Eggs." In March, the Academy met jointly with the Junior Academy to award certificates of merit; and it heard Louis H. Bean talk on "The Science and Art of Predicting," a subject in which he has great competence as proved by his ability to interpret trends to the political and economic satisfaction of his adherents. In April, the Academy heard David H. Johnson, curator of mammals at the National Museum, give his views on the distribution of mammals on islands in the Pacific Ocean. He stressed the special adaptations that successful migrant species needed to surmount distributional barriers. In May, W. O. Baker, vice president of the Bell Telephone Laboratories, spoke to the Academy on "Logical Processes in Creatures and Crystals." He explored the analogy of digital information coding of perception and experience.

During the summer months the Academy suspended its meetings, but reconvened in October to hear S. L. Madorsky give his impressions of a recent trip to Russia, where he and his wife had the advantages of linguistic parity and informal, friendly reception by scientists. The meeting was heavily attended, and some members were unable to hear the presentation. In November, the Academy met jointly with the Washington Chapter of Sigma Xi and the Junior Academy to hear E. B. Wilson discuss the introduction of young people to scientific research as a career. A lively discussion by many members of the

Junior Academy followed this talk. On December 15, a concatenation of early winter and the secretary's failure to get out notices resulted in the meagerest attendance at one of the most interesting and timely presentations that the Meetings Committee has been able to arrange—a presentation by Harry Wexler of the Weather Bureau on the use of televising satellites in analyzing and predicting world-wide weather effects. Dr. Wexler's grace and good humor in the face of the restrictions imposed by his everyday adversary, the weather, were much appreciated by the audience that braved the storm to hear him.

In January 1961, the annual dinner meeting of the Academy witnessed the presentation of the annual awards for distinguished service:

*Biology*—Louis S. Baron, Walter Reed Army Institute for Research; *Engineering*—Romald E. Bowles, Diamond Ordnance Fuze Laboratory; *Physical sciences*—Richard A. Ferrell, University of Maryland; *Mathematics*—Philip J. Davis, National Bureau of Standards; *Teaching of science (high school)*—Pauline Diamond, Sherwood High School; *Teaching of science (graduate)*—Karl F. Herzfeld, Catholic University.

During the course of the year, the adoption of the new Bylaws and Standing Rules has improved the relationship between the Academy and its affiliates and permitted their freer cooperation. It is hoped that more active interest of the affiliates will be engendered also by the experimentation with the content of the *Journal*, espe-

cially as it affects the overall interests of the Washington scientific community. The disaffection of some members on the decision to cease using the *Journal* for primary publication of experimental and descriptive research has been distressing to the Board and its officers; but paradoxically it proved to be the final incentive to generate new publications specifically and categorically dedicated to such publication. Should the efforts of succeeding Boards be successful in raising the pitifully inadequate dues (\$6.00), the Academy may be in a position to devise means and to support other needs of its community, including archival publication if this is indeed a problem. Goals for the immediate future are the synthesis of disciplines and categorical fields into stimulating cross-fertilizations through symposia and conferences.

The support of science education has been increasingly successful with the granting of funds to the Academy for this purpose, and the use of these by the Joint Board on Science Education to pursue experimental approaches to teaching mathematics and physics or chemistry together. A roster of speakers and counselors is also now maintained for the use of metropolitan area school science teachers and clubs. The sponsorship of minor financial aid to selected students engaged in summer laboratory experience has been a successful venture of the Junior Academy beyond its usual activities in Science Fair promotion.

—Heinz Specht, Secretary, 1960

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors have been assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, care of Agricultural Marketing Service, U. S. Department of Agriculture, Rm. 3917 South Bldg., Washington 25, D. C.*

## COAST AND GEODETIC SURVEY

Elliott B. Roberts is the author of a detailed review article, "The IGY in Retrospect," recently

published in the *Smithsonian Report* for 1959.

## GEORGE WASHINGTON UNIVERSITY

Ira B. Hansen, professor of zoology, and Charles R. Naeser, professor of chemistry, were recently elected to represent Columbian College on the newly-constituted University Senate. This body will be the senior group representing faculty interests in the affairs of the University.

Benjamin D. Van Evera visited University establishments at Monterey, Calif., and El Paso, Tex., with Acting President Colclough, in early December, to survey units of the Human Resources Research Office.

Mary L. Robbins, professor of bacteriology, has been appointed a member of the newly-created Film Project Advisory Board of the National Science Teachers Association, and a member of the Administrative Committee of the Board. She spoke before the Third Conference on the Participation of Women in Science, December 27, at the AAAS meetings in New York. Ernestine B. Thurman, NIH, served as chair-

man of the conference.

## HARRIS RESEARCH LABORATORIES

**Louis R. Mizell** has been elected chairman and **Edmund M. Buras, Jr.**, treasurer of the Washington Section of the American Association of Textile Chemists and Colorists for 1961. Both are project leaders at HRL.

On January 14, Mr. Buras participated in the conference on "Chemistry Teaching in the Washington Metropolitan Area" sponsored by the Joint Board on Science Education.

## NATIONAL BUREAU OF STANDARDS

Academy members presenting papers at recent meetings have included the following:

**Samuel N. Alexander**, "The Russian Approach vs. the American Approach to Computers and Data Processing"—Civil Service Commission Seminar, Brookings Institution, Washington, December 9; **Roger G. Bates**, "The Use of Amine Buffers for pH Control"—Conference on "In Vitro and In Vivo Effects of Amine Buffers"—New York Academy of Sciences, New York, December 12; **Irvin H. Fullmer**, "Some Fundamentals of Modern Dimensional Metrology"—Huntsville Chapter, American Society of Tool and Manufacturing Engineers, Huntsville, Ala., January 5; **Forest K. Harris**, "The Status of Electrical Standards"—Precision Measurements Association, Los Angeles, January 4; **Charles M. Herzfeld**, "The Standards Laboratory and Rocket Testing"—American Rocket Society, Washington, December 5-6; **John D. Hoffman**, "Crystallization of Polymers from Bulk and Dilute Solution"—Massachusetts Institute of Technology, Cambridge, Mass., January 5; **George C. Paffenbarger**, "Dimensional Stability of Dentures"—U. S. Naval Dental Clinic, Norfolk, Va., in December; and **Earle K. Plyler**, "High Resolution Spectroscopy of the Infrared Region"—Indian Academy of Science, Madras, India, December 27.

## NATIONAL INSTITUTES OF HEALTH

**G. Robert Coatney**, chief of the Laboratory of Parasite Chemotherapy, National Institute of Allergy and Infectious Diseases, recently returned from Geneva, Switzerland, where he served as chairman of the Technical Committee on Chemotherapy of Malaria, World Health Organization, November 14-19. Dr. Coatney is the newly-elected president-elect of the American Society of Tropical Medicine and Hygiene.

## OPERATIONS RESEARCH OFFICE, JHU

**Bernard B. Watson** served as editor of "The Delayed Effects of Whole-body Radiation: A Symposium," recently published by the Johns Hopkins Press.

## USDA, BELTSVILLE

**Erwin L. LeClerc**, director of Biometrical Services, ARS, participated in a program review of the Biometrics Unit of the Department of Plant Breeding, Cornell University, in October. On November 7, Dr. LeClerc presented a paper at the Second National Congress of Entomology and Phytopathology at Chapingo, Mex.

## WEATHER BUREAU

**Charles S. Gilman** left October 15 for a two-year assignment with the UN at Santiago, Chile.

## DEATHS

**Joseph S. Wade** died on January 1 at the age of 80. He served with the Department of Agriculture from 1906 until his retirement in 1950. After retirement, he continued with the Department as an official collaborator. Mr. Wade was a native of Cumberland County, Ky. He was educated at Fairmount College, Wichita, Kans., at Iowa State University, and at the University of Chicago. His research was concerned with insects injurious to cereal and forage crops in the central and plains states. Mr. Wade was the author of more than 600 publications on scientific, historical, and literary subjects. He was a former president of the Entomological Society of Washington and the Biological Society of Washington.

## AFFILIATED SOCIETIES

### Acoustical Society of America, Washington Chapter

At the January 16 meeting, Wayne D. Wilson, Naval Ordnance Laboratory, spoke on "Sound Velocity, its Measurement, and Applications." The meeting was preceded by an informal dinner at the Cafe Burgundy.

### American Institute of Electrical Engineers, Washington Section

On January 10, Herbert Friedman, Naval Research Laboratory, addressed the Section on "Recent Results of Upper Atmosphere Research."

The Student Guidance Committee is addressing itself anew to the problem of impressing upon gifted students the challenges, opportunities, and potential rewards of careers in science or engineering.

The Science and Electronics Division held its first meeting on December 15, featuring a talk by David Cook, Naval Research Laboratory, on "Elementary Particles and Their Detection." A second Division, Telemetry and Instrumentation, met on January 9 to hear Gilbert Jaffee, Navy Hydrographics Office, on "Under-Sea Exploration Instruments and Equipment." The cancelled December meeting has been rescheduled for March.



## **American Society of Civil Engineers, National Capital Section**

Dean Cornelius Wandmacher, University of Cincinnati, was the principal speaker at a joint meeting, January 10, on current trends in engineering education, with the American Society of Engineering Education, National Capital Area. He reported on the Conference of Civil Engineering Education held last July at Ann Arbor, Mich., at which proposals were made for modifying the context and extending the period of instruction.

The January luncheon meeting, on the 24th, presented Waldo G. Bowman, editor of *Engineering News Record*, reporting on a recently-completed world tour.

Four programs remain in the 1961 Forum Series, which compares United States resources policy and administration with those of other nations; admission is unrestricted, and programs are scheduled for 2 to 4 p.m. at the Brookings Institute, 1775 Massachusetts Ave.

February 2—National Park Administration in England.

February 16—Regional Resources Development in Southern France.

March 2—Preservation of Natural Areas in Great Britain.

March 16—Pollution Abatement in the Ruhr Valley of Western Germany.

## **Botanical Society of Washington**

Officers elected in December are: President, W. D. McClellan, USDA; vice-president, Robert W. Krauss, University of Maryland; recording secretary, R. A. Paterson, University of Maryland; corresponding secretary, Marie Lack, USDA; treasurer, A. A. Piringer, USDA; and councillors, Father Duman, and Richard Cowan.

On January 3 Chester Emmons, NIH, spoke on fungi pathogenic to man with special reference to natural infections and the ecology of infection initiation.

## **Chemical Society of Washington**

Incoming officers for 1961 are William J. Bailey, president; John L. Torgesen, president-elect; Samuel B. Detwiler, Jr., secretary; and Leo Schubert, treasurer.

At the Board of Managers meeting on January 10, the Society's 1961 budget was approved in the amount of \$4,575. Estimated income for 1961 is \$5,826, as compared with \$3,698 in 1960.

At the same meeting, President Bailey reported on the activities of a Special Committee on Member Participation, which over the past several months has been conducting a survey of member interests. Although the survey has been only partially completed, it already has brought to light the fact that a large number of Society members, not now engaged in committee work, would like to be so engaged. Pursuant to this report, the Board approved the establishment of three new

special committees—on employment, boy scout chemistry merit badge counseling, and women's programs. Another contemplated new field of activity—science fair project counseling—will be handled by the Standing Committee on Education.

It was announced that Frank T. McClure of the Applied Physics Laboratory had won the Society's 1960 Hillebrand Award. Dr. McClure will be guest of honor at the annual Hillebrand Award Dinner, to be held on March 9.

## **Entomological Society of Washington**

Newly installed officers are: President, J. F. Gates Clarke, National Museum; president-elect, Harold H. Shepard, USDA; recording secretary, Ernestine B. Thurman, NIH; corresponding secretary, Paul A. Woke, NIH; treasurer, Price G. Piquett, USDA.

## **Geological Society of Washington**

Three papers were presented at the January 11 meeting: L. L. Thatcher and C. W. Carlston, "Tritium in the Hydrologic Cycle"; Mark W. Pangborn, Jr., "Geology and Geologists in Fiction"; and George H. Drury, "Hydrologic Implications of Meandering Valleys."

Present officers are: President, G. Arthur Cooper; first vice-president, Harold M. Bannerman; second vice-president, C. L. McGuinness; secretaries, John T. Hack and Frank C. Whitmore, Jr.; and treasurer, Margaret Cooper.

## **Helminthological Society of Washington**

Officers for 1961, installed in December are: President, Lloyd E. Rozeboom, Johns Hopkins University; vice-president, Carlton M. Herman, Patuxent Research Refuge; corresponding secretary-treasurer, Edna M. Buhner, USDA; and recording secretary, A. James Haley, University of Maryland.

## **Insecticide Society of Washington**

On January 18, W. E. Westlake, Agricultural Research Service, spoke on "Recent Developments in Instruments for Pesticide Residue Analysis"; and Arthur D. Moore spoke on "Probing Some of the 'What's' and 'Why's' in Insecticidal Control of Forest Insects."

## **Institute of Radio Engineers, Washington Section**

John W. Clark, Hughes Aircraft Co., described to the Section on January 9 the Hughes "Mobot"—a mobile, radio-controlled robot with sight, touch, and hearing designed to perform tasks too hazardous or difficult for man, such as handling fissionable materials, fire fighting, deep ocean exploration, bomb disarming, demolition, etc.

## **Medical Society of the District of Columbia**

Air France advertises a European tour, August 8-September 1, for members of the Society, their families and friends, to coincide with the International Congress on Mental Health in Paris.

### **Philosophical Society of Washington**

The retiring president, Louis R. Maxwell, delivered an address on January 13, entitled "Magnetic Atoms Amongst Others."

### **Society for Experimental Biology and Medicine, District of Columbia Section**

The December 1 program consisted of three papers, as follows: Margaret Kelly, NIH, "Protective Action of AET Against Radiation and Alkylating Agents"; Howard Reynolds, USDA, "Effect of Carbohydrate on Growth and Utilization of Nitrogen by *Tetrahymena pyroformis*"; and Leo Wislicki, Georgetown University, "Effects of Neuromuscular Blocking Agents on Direct Excitability of Striated Muscle."

### **Society of American Bacteriologists, Washington Branch**

The January meeting of the Branch included papers by M. Rogosa, NIH, on "Nitrate Reduction and 'Catalase' Formation by Certain Lactobacilli," and R. A. Finkelstein, Walter Reed Army Institute of Research, on "Non-Specific Resistance Mechanisms in Embryonated Eggs."

### **Society of American Foresters, Washington Section**

On January 26, at the Section meeting, Jerome F. Seaman of the Forest Products Laboratory, Madison, discussed "Realistic Outlook on New Forms of Wood Utilization."

## **CALENDAR OF EVENTS**

Entries which do not include information as to the nature of the program, exact time or location, or other data are, in most instances, regular meetings of the society in question. Except where our correspondents have notified us to the contrary, we assume that the date and location of such meetings remain unchanged from month to month.

### **February 7—Botanical Society of Washington**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:00 p.m.

### **February 8—Geological Society of Washington**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:00 p.m.

### **February 9—American Society of Mechanical Engineers, Washington Section**

Jacob Rabinow, "Creative Design"; E. L. Daman, "Supercharged Boilers for Stationary and Marine Application."

Pepco Auditorium, 10th and E Sts., N.W., 8:00 p.m.

### **February 9—Chemical Society of Washington**

Joint meeting with Washington Junior Academy of Sciences. John Turkevich, Princeton University, "The World of Fine Particles."

Museum of Natural History Auditorium, Constitution Ave. at 10th St., N.W., 8:15 p.m.

### **February 10—Philosophical Society of Washington**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:15 p.m.

### **February 11—Institute of Radio Engineers, Washington Section**

Annual banquet.  
Statler-Hilton Hotel.

### **February 13—American Society for Metals, Washington Chapter**

Stanley Smith, Institute for the Study of Metals, University of Chicago, "History of the Science of Metals."

AAUW Headquarters, 2410 Virginia Ave., N.W.

### **February 13—Institute of Radio Engineers, Washington Section**

#### **Digital TV.**

Museum of Natural History Auditorium, Constitution Ave. at 10th St., N.W., 8:00 p.m.

### **February 14—American Institute of Electrical Engineers, Washington Section**

Pepco Auditorium, 10th and E Sts., N.W., 8:00 p.m.

### **February 14—American Society of Civil Engineers, National Capital Section**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:00 p.m.

### **February 15—Insecticide Society of Washington**

Symons Hall, University of Maryland, 8:00 p.m.

### **February 15—Washington Society of Engineers**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:00 p.m.

### **FEBRUARY 16—WASHINGTON ACADEMY OF SCIENCES**

### **February 20—Acoustical Society of America, Washington Chapter**

Gallaudet College, 8:00 p.m.

### **February 20—Society of American Military Engineers, Washington Post**

YWCA, 17th and K Sts., N.W., 12:15 p.m.

**February 21—Anthropological Society of Washington**

**Daniel E. Berlyne, Boston University,  
"New Directions in Motivation Theory."**

Museum of Natural History, Room 43, Constitution Ave. at 10th St., N.W., 8:15 p.m.

**February 22—Geological Society of Washington**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:00 p.m.

**February 23—American Society of Mechanical Engineers, Washington Section**

Peppo Auditorium, 10th and E Sts., N.W., 8:00 p.m.

**February 24—Philosophical Society of Washington**

John Wesley Powell Auditorium, 2170 Florida Ave., N.W., 8:15 p.m.

**February 28—American Society of Civil Engineers, National Capital Section**

YWCA, 17th and K Sts., N.W., 12:00 noon.

**February 28—Society of American Bacteriologists, Washington Branch**

Sternberg Auditorium, Walter Reed Army Institute for Research, 8:00 p.m.

## **ACADEMY ACTIVITIES**

### **DECEMBER BOARD MEETING**

The following notes are for the timely information of the membership; they are not the official minutes of the meeting. Ed.

The Board of Managers held its 533rd meeting on December 20, 1960 at NBS, with President Wood presiding.

The minutes of the 532nd meeting were approved with minor corrections.

The Board suspended the regular order of business in order to accommodate Ralph Cole of Melpar, a member of the Washington Board of Trade, who discussed a projected movement for establishment of a Greater Washington Scientific Bureau under the auspices of the Board of Trade. This bureau would expect "to fulfill a need in the Greater Washington area of a better means of cohesion of scientific industry, professional societies, the universities, and the community at large." Its functions might include (a) improvement of graduate scientific education by such means as establishing new professorships for specialized subjects; (b) conduct of a monthly self-supported publication to disseminate meeting notices and other information of value to the scientific and industrial community; (c) provision of a central office for professional administration of scientific societies, possibly with a phone serv-

ice and mailing and addressing functions, or provision of a meeting room; (d) assistance in promoting such meetings as "Engineers, Scientists, and Architects Day"; (e) enhancement of the scientific atmosphere of the Greater Washington area by publication of a brochure emphasizing the scientific community and value of the institutions to be found here.

Financial support for the first year was estimated at \$17,500, which would enable hiring a full-time executive director and his secretary. Up to \$2,000 of this amount might be provided by professional societies, the remainder by scientific industry of the area. Mr. Cole emphasized that "what is required from the scientific and professional societies is a sincere expression of the types of services that they believe would enhance their operation stated in the order of the priority with which they would like to see them established." He urged the establishment of an ad hoc Academy committee to formulate a position in the matter.

After considerable discussion, Dr. Wood advised Mr. Cole that the Board would consider the matter further, in particular the idea of setting up an ad hoc committee to define the special services that the proposed Scientific Bureau might provide. Further discussion was deferred in favor of the regular order of business.

Dr. Wood announced the appointment of a Committee on the National Zoo, with Carlton M. Herman as chairman and Keith C. Johnson and George W. Wharton as members.

Chairman Hall of the Membership Committee presented for first reading the names of 22 candidates for membership.

Chairman Mahan of the Awards Committee distributed an extensive report, including a resume of the responsibilities of the Committee, its recommendations to succeeding committees, and its nominations of individuals for scientific achievement awards for 1960. (See also story on award winners elsewhere in this issue.) The report was accepted. The Board also agreed that award winners, upon becoming members of the Academy, should not be obliged to pay dues for the remainder of the current year or for the following year.

For the Policy and Planning Committee, Dr. Sookne reported on plans to hold a dinner meeting with the presidents and delegates of affiliated societies for the purpose of improving Academy relations with the societies. It was expected to hold this dinner some time during February.

Following the second reading of their names, Dorothy Carroll and Alfred M. Pommer were elected to membership in the Academy.

Treasurer Aslakson pointed out a discrepancy in the treasurer's reports for January 1—June 21, and January 1—September 30, as summarized in



the November *Journal* (page 16, columns 1 and 2). In one case, the figures include Junior Academy receipts and disbursements; in the other case, they do not. Comparable totals, not including the Junior Academy figures, are as follows:

January 1—June 21: Receipts, \$9,605; disbursements, \$8,850.

January 1-September 30: Receipts, \$11,599; disbursements, \$12,302.

Dr. Schubert reported for the Science Education Committee that a request had been made to the National Science Foundation for a grant of \$40,000 to extend the science education projects currently going forward; NSF has suggested paring this to \$27,000, and the matter is currently under consideration.

In a discussion led by Chairman Hall of the Membership Committee and Chairman Mahan of the Awards Committee, it was agreed that runners-up for science achievement awards could be considered for Academy membership on the basis of the background information developed by the Awards Committee.

## JOINT BOARD

### ON SCIENCE EDUCATION

The Joint Board has now passed the half-way point in its current series of conferences on the teaching of science. Two conferences on teaching general science have taken place—one each in Virginia and the District of Columbia. In addition, area-wide conferences have been held on the teaching of physics and the teaching of chemistry.

Each conference follows a similar pattern. After an opening address on a topic of general interest in the subject-matter area of the conference, the remainder of the day is devoted to a general discussion of problems in science teaching, with emphasis on ways in which scientists of the area may be of assistance in improving science education.

The remaining conferences have been scheduled as follows:

General Science Teaching—Prince Georges County Area—University of Maryland—February 11—John K. Taylor, moderator.

Mathematics Teaching—Area-wide Conference—Mt. Vernon Seminary—February 25—Raymond J. Seeger, moderator.

General Science Teaching—Montgomery County Area—Landon School—March 11—Raymond J. Seeger, moderator.

Biology Teaching—Area-wide Conference—National Institutes of Health—April 8—John K. Taylor, moderator.

As in the preceding conferences, persons invited include about 60 teachers from the secondary schools of the particular area, and 40 persons representing college teachers and scientists from various research institutions. School contact representatives are especially invited. Luncheon is provided by the Joint Board from the grant received from the National Science Foundation.

While every effort is being made to invite interested persons, it is inevitable that some who are vitally interested in local school programs may be overlooked. Members of the Academy desiring to be invited should make it known to John K. Taylor, director of science projects, at the office of the Joint Board, 1530 P Street, N.W., Washington 5. Invitations will be extended as far as possible within the attendance limitation of 100 persons.

The proceedings of these conferences, as well as reports of other activities carried out under the NSF grant, will be published in a final report that will be sent to all participants. Others desiring copies should request them from the Joint Board. A limited number of copies of the 1959-60 report are still available upon request.

### THE BROWNSTONE TOWER



When it was announced that Hiroshima had been destroyed by an American atomic bomb on August 6, 1945, I was working in my office on the eighth floor of the Brownstone Tower. I was depressed rather than elated by this news because I felt that in just a few years the Washington that I knew and loved might be obliterated in the same way. As I expected, much progress has been made in atomic weapons and their delivery, and the destruction of Washington can probably be accomplished whenever our enemy is willing to pay the price. Indeed, I am somewhat astonished that I am still alive and working in Washington more than 15 years after that first explosion in Japan. Yet we continue to plan and build for the future as if we were not vulnerable. I am reminded of R. L. Stevenson's flaunting of death in "Aes Triplex." Of people living on active volcanoes he wrote, "There are serenades and suppers and much gallantry among the myrtles overhead; and meanwhile the foundation shudders underfoot, the bowels of the mountain growl, and at any moment living ruin may leap

sky-high into the moonlight, and tumble man and his merry-making in the dust." He implies that there is something admirable about the behavior of men who are so unafraid of death that they do not bother to move away from the volcano—or from probable targets of atomic bombs.

I live in the center of a target and have been just as fatalistic about it as the citizen who doesn't even know the name of the Office of Civil and Defense Mobilization. I have chosen to ignore the threat of atomic blasts and fallout and of chemical and biological warfare. But when I think of it, I don't feel brave, but just selfish. For it is selfish to say, "I have lived long enough; my way of life is fall'n into the sear, the yellow leaf; . . ." and it matters little whether I leave it this year or next, by atomic violence or by pathogenesis. It does matter to the future of mankind whether fools like me try to survive modern warfare. Certainly there should be some reasonable compromise between ignoring the problem of nonmilitary, or civil, defense and being obsessed by it.

The foregoing thoughts were generated by my recent attendance in line of duty (I would have avoided it otherwise) at a meeting on improvement of our defenses against insidious chemical and biological agents that might be applied whenever it suits our enemy to attack us. Later I read what must certainly be the most up-to-date and authoritative book on the subject. It is "Nonmilitary Defense: Chemical and Biological Defenses in Perspective," the proceedings of a symposium held in Cleveland at the April 1960 meeting of the American Chemical Society (ACS). Priced at \$2.00, it can be obtained from the Special Issue Sales Department of ACS at 1155 16th Street N. W., Washington 6, D. C. This 100-page paper-covered book ought to be read by every scientist who has been ignoring nonmilitary defense and feeling uneasy about it.

It is hard to believe, but true nevertheless, that the Washington metropolitan area could be depopulated by a chemical bomb or by a biological bomb, just as well as by an atomic bomb; the only difference would be that buildings and other facilities would remain intact after chemical or biological attack. Back in 1945 in the Brownstone Tower I was not aware of biological and chemical warfare (BW-CW) as a major threat against civilian populations; now I am, though many scientists may still be unaware of the power of BW and CW to kill and incapacitate.

By biological warfare I mean the planned dissemination by an enemy of microorganisms pathogenic to man or to his domestic animals or crops with the intention of causing death or disability of military personnel; or casualties, food shortages, or governmental and economic paralysis in the civilian population. Although

biological agents may be disseminated by conventional military weapons in open warfare, they are particularly suited for silent, insidious, subversive application, the results of which may be indistinguishable from those of a natural epidemic, epizootic, or epiphytotic. Man may be infected by inhaling air containing viable microorganisms, by ingesting contaminated food or beverages, or by being attacked by vectors of diseases—all of which are subject to manipulation by an enemy. Toxins produced by microorganisms are included in the biological arsenal.

By chemical warfare I mean the planned dissemination by an enemy of organic chemicals toxic to man so as to cause death or various degrees and kinds of disabilities for various periods. CW is a biological as well as a chemical subject, because the target is man.

I think the people in this area should know more about BW-CW than they do. They should know what might be used against them, how it might be applied, how they might be affected, and how they may protect themselves. The scientists of the area should take the lead in informing their fellow-citizens of these lethal applications of science and of the beneficent by-products of research on the development of biological and chemical weapons. Many disciplines pure and applied are involved. Surely no organization in this area is more appropriate than the Washington Academy of Sciences for taking the lead in the missionary work that needs to be done. I recommend that a Committee on Nonmilitary Defense be set up in the Academy to keep in touch with developments in the light of the special needs of our community and to suggest what should be done for our protection. Through the educational program of the Joint Board the story can be brought to our secondary school students, who may in turn take it to their parents. I had previously signed up to talk upon request on "the flowers that bloom in the spring"—on trees. I shall do so, but I also want to preach on nonmilitary defense to any audience that will listen.

—Frank L. Campbell

## SCIENCE AND DEVELOPMENT

A newly-established high-speed weather facsimile network is being used by the Weather Bureau to transmit weather analyses and forecast maps. The new network is capable of transmitting weather maps twice as fast as the circuit formerly used. The upper air charts are prepared with the aid of the Bureau's electronic computer and drawn by a new electronic weather plotter. More than 100 weather maps are sent over the network every 24 hours to

about 650 government, military, and commercial receiving stations in 330 cities of the United States and southern Canada.

**The University of Maryland has received a license from the Atomic Energy Commission to operate a 10-kilowatt, pool-type reactor.** It will be constructed on the campus at College Park and will be used for student training and research.

**A modern \$12,212,800 building for the Food and Drug Administration in Washington is scheduled to be completed in March 1963.** The six-story building, with basement and sub-basement, will provide 300,000 square feet of assignable space and will provide, for the first time, a consolidated headquarters and laboratory for most of the operations in the Washington area. At the present time some Bureaus have units in as many as three different locations, separated by distances of one block to three miles. The new building will be located across Third Street from the HEW buildings and connected with them by a tunnel.

**The land surface in part of the Santa Clara Valley, California, has subsided as much as 9 feet since 1912, according to a report by the Geological Survey.** The area is about 13 miles wide and extends about 25 miles, from Redwood City to southern San Jose. The subsidence is attributed to a lowering in artesian pressure caused by pumping from wells. The rate of subsidence averages about a foot for each 13 feet decline in pressure.

**Oil-in-water paints for outside use have been developed by USDA chemists.** The linseed oil-in-water emulsion paints can be diluted with water, but they resist water within 15 minutes after application and are sufficiently dry after 30 minutes to permit application of another coat. The paints adhere well to chalking surfaces, cover well, pour and flow easily, and do not readily form lap marks. Some of the experimental paints containing zinc oxide remained stable on the shelf more than 46 weeks. Instability of emulsion paints containing zinc oxide has limited their use in the past. Development of new emulsifiers from linseed oil fatty acids has overcome this difficulty.

**A weapon that preceded by centuries the bow and arrow in the New World is still in use.** A coot-hunting trip on Lake Patzcuaro in western Mexico, in which the only weapon used was the spear thrower—the Aztec *atlatl*—is described in a recent Smithsonian report by Matthew W. Stirling, retired director of the Bureau of American Ethnology. Use of the *atlatl* long before the first Europeans reached the New World presumably was general over most of the two American continents, Dr. Stirling says. Relatively speaking, the bow was a late invention. By the time of the first white settlers, however,

its use was confined largely to the highly cultured Maya of Central America and the Incas of Peru. Presumably this was due in large part to the fact that hunting, for which the bow was more effective, played a relatively small part in the economy of these highly cultured and essentially horticultural people. For this purpose there was no incentive to change weapons.

**An insect attractant that occurs naturally in the female gypsy moth has been synthesized by Martin Jacobson and fellow workers in the U.S. Department of Agriculture.** They have also synthesized a related chemical that is equal to the natural lure as an attractant and can be produced cheaply in large quantities. The attractant is used to bait traps used in surveys to determine the location and extent of gypsy moth infestations and to check the effectiveness of chemical sprays. Collecting the insects and preparing the natural attractant was very expensive and time consuming. At times it has been necessary to depend on imports from Europe.

**A conferendum of nuclear education programs in the United States has been published by the Oak Ridge Institute of Nuclear Studies.** The 76-page brochure lists 175 schools offering instructions in nuclear fields. It details the degrees, courses and facilities at each university and notes the availability of fellowships or assistantships. Institutions are listed with plasma and thermonuclear research facilities, particle accelerators, and gamma radiation facilities. Existing or planned university reactor installations are indicated according to type.

## EDITORIAL COMMENT—

It is with considerable regret that we announce the resignation of Ileen E. Stewart as managing editor of the *Journal*. Drawing upon her extensive professional experience, Mrs. Stewart designed the 1960 *Journal*, found a suitable printer, developed many of the regular features that have appeared in each issue, served as a focal point for the rest of the staff, and spent countless hours each month in copy editing and putting the magazine together. We deeply appreciate her efforts.

John Taylor's feature story on the Academy's annual dinner and award presentations was prepared before the snowstorm of January 19 and the incredible traffic snarl that resulted. President Wood reports that the meeting did go forward, substantially as scheduled, although two of the awards had to be conferred *in absentia*. About 40 indomitable souls were present, out of an anticipated attendance of a hundred. The rest, like us, presumably were sitting it out in icy streets, or trudging homeward through the drifts.

## Vice-Presidents of the Washington Academy of Sciences Representing the Affiliated Societies

Acoustical Society of America .....	RICHARD COOK
Institute of the Aeronautical Sciences .....	<i>Not Named.</i>
Anthropological Society of Washington .....	REGINA FLANNERY
Society of American Bacteriologists .....	MARY LOUISE ROBBINS
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Chemical Society of Washington .....	WILLIAM J. BAILEY
American Society of Civil Engineers .....	<i>Not Named.</i>
International Assn. for Dental Research .....	GERHARD BRAUER
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Society of American Foresters .....	<i>Not Named.</i>
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Amer. Society of Mechanical Engineers .....	WILLIAM G. ALLEN
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American Society for Metals .....	JOHN A. BENNETT
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Institute of Radio Engineers .....	ROBERT HUNTOON
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Philosophical Society of Washington .....	LOUIS R. MAXWELL
Society of American Military Engineers .....	<i>Not Named.</i>

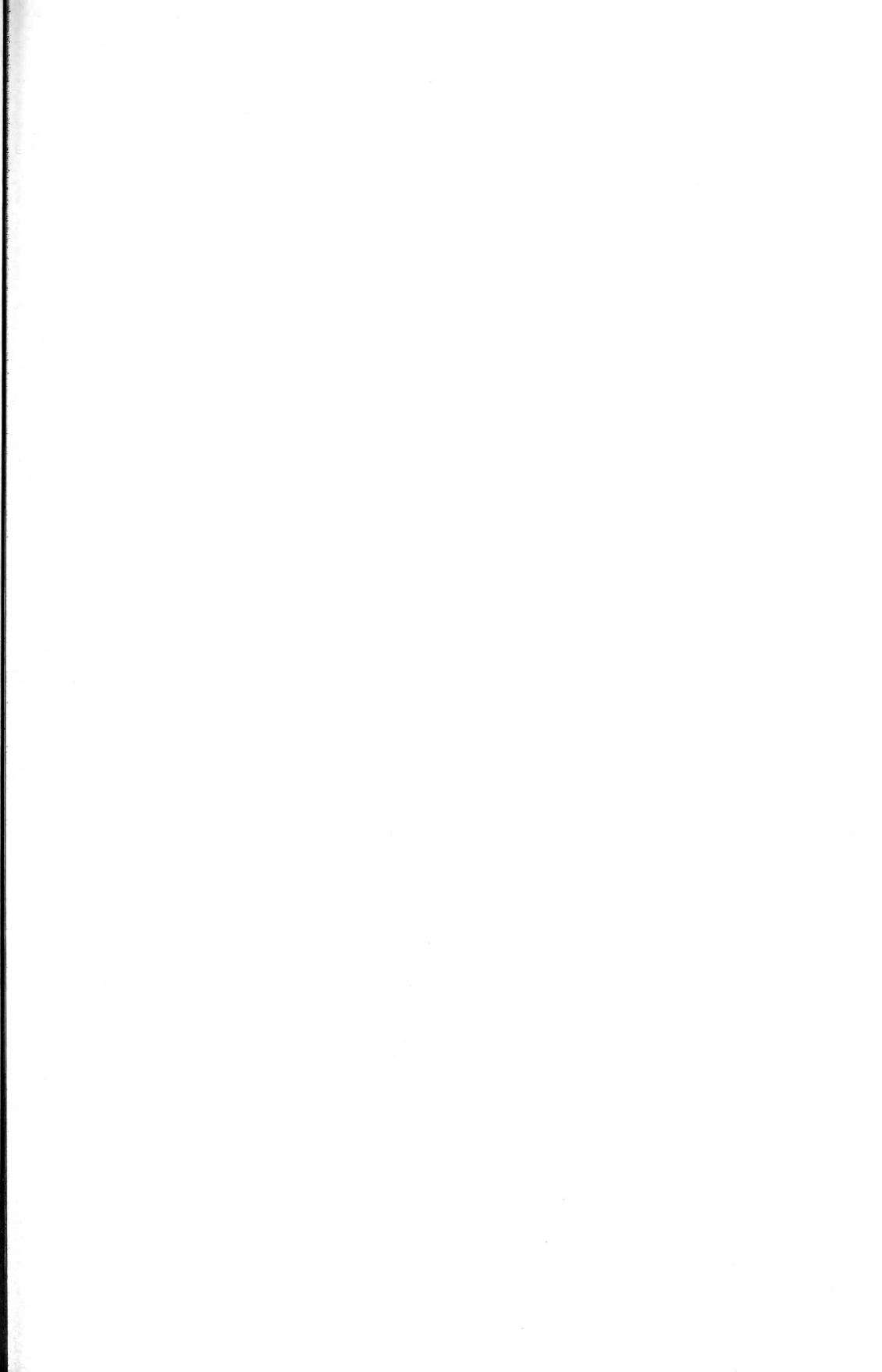
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# JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

**Editor:** SAMUEL B. DETWILER, JR., Department of Agriculture

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HAROLD T. COOK, Department of Agriculture	JOHN K. TAYLOR, National Bureau of Standards

## Staff Assistant

RICHARD P. FARROW, National Canners Association

## Contributors

ALBERT M. STONE, Applied Physics Laboratory	ALPHONSE F. FORZIATI, National Bureau of Standards
JOHN A. O'BRIEN, JR., Catholic University	HOWARD W. BOND, National Institutes of Health
ELLIOTT B. ROBERTS, Coast & Geodetic Survey	ILEEN E. STEWART, National Science Foundation
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LLOYD N. FERGUSON, Howard University	HAROLD T. COOK, USDA, Washington
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# The Academy's Program for 1961

**Philip H. Abelson**

*Geophysical Laboratory*

Metropolitan Washington is potentially one of the great scientific centers of the world. Our colleagues participate in creative research and in administrative decisions which have impact throughout this nation and the globe. The huge Government laboratories, together with increasing non-governmental activity, provide employment for perhaps 20,000 scientists here. This is of the same order of magnitude as in the Boston and New York areas.

Unfortunately, the Washington scientific community is only moderately effective in cooperative efforts having major impact. Our performance, when judged in the light of Boston or New York, is relatively weak. The American Academy of Arts and Sciences with its *Daedalus* has sowed seeds which are now coming to fruition in affecting national policy on disarmament, and had a significant role in the appointment of Dr. Wiesner as the President's Science Adviser. The New York Academy has long sponsored imaginative symposia which have foreshadowed major developments in new areas of science.

The Washington Academy of Sciences is one of the few organizations which can speak for science in Washington and can take action for the whole community. It has made notable contributions in the past, and has been particularly successful in recent years in the encouragement of young science talent through such activities as the Junior Academy of Sciences. This is an activity which should continue.

However, an even greater effort needs to be focused on the revitalization of the senior Academy. One area which needs thought and effort is the fostering of fellowship among the members of our community. I have often noted an important contrast between Boston and Washington.

The members of the northern city have far more intensive intellectual and social contacts than do we here. They are far more aware of the resources of the community, and far better informed as to the qualities of their colleagues. As a result they are able to support each other effectively in various ventures. When important positions become available in Washington or elsewhere in the nation, they are able with clear conscience to recommend one of their colleagues.

An analysis of the successes and failures of other communities would doubtless be valuable, and will be undertaken. However, we shall not dwell on it further here, but will indicate some of the things we have already decided to do during this year. One of the steps which will be taken is a determined drive to increase our membership, particularly among younger men who are active in the affairs of the affiliated societies. A more vital group would have increased potential for constructive projects.

A second effort will be to increase the quality and number of our inter-disciplinary meetings. These are one of our best ways of bringing together in friendly contact the creative minds of our community.

A third action will be to give all possible support to building up the *Journal* of the Washington Academy of Sciences. We are fortunate in having an excellent editor, and he merits every financial and other cooperation.

In these undertakings I shall have the benefit of much advice and assistance from chairmen and members of various committees. The tasks, however, are large, and we shall appreciate and welcome suggestions and offers of help from everyone.

# Unorthodoxy in Science\*

Lawrence A. Wood

National Bureau of Standards

## I. Introduction

The scope and magnitude of modern science are truly tremendous. We all know of the years required for an individual to assimilate what is called the generally accepted scientific knowledge in even a very strictly limited field. Not often is consideration given to the question of what we mean by the glib phrase "generally accepted" or how a given concept attains that exalted state.<sup>1</sup> It is certainly very interesting and perhaps instructive to examine a number of cases in which the concepts have run counter to the generally accepted scientific principles of their time. In other words, I invite your attention to unorthodoxy in science.

## II. The Acceptance of Scientific Ideas

At first sight, the term orthodox seems out of place in a scientific connotation. After all, we pride ourselves on eliminating subjective influences in science, and it should make no difference whether or not we hold the "right opinion"—the literal meaning of orthodoxy.

However, the actual history of the acceptance of a scientific concept is conditioned throughout by the fact that scientists are human beings subject to errors, emotions, beliefs, and pride.

I. Bernard Cohen, professor of the history of science at Harvard, has said:<sup>2</sup> "Any suggestion that scientists so dearly love truth that they have not the slightest hesitation in jettisoning their beliefs is a mean perversion of the facts." If this is true, we may well ask the question: "Who is to determine the generally-accepted position in

scientific matters?" In actual practice in recent times, it is the program committees, the journal editors and reviewers, and the textbook writers. They are forced by considerations of space to determine whether it is permissible to devote space to a given doubtful concept.

## III. Examples of Unorthodoxy in Science

Let us examine twelve instances of individuals who propounded ideas that were regarded as distinctly unorthodox at the time they were proposed.

1. *Copernicus*.—The first unorthodox idea I shall mention was that of the heliocentric universe propounded by Copernicus about 1530. It was distinctly at variance with the geocentric universe of Aristotle, which had dominated men's thinking for over 1800 years. It became quantitative with the careful astronomical observations of Tycho and Keppler. Thus it gained general acceptance in about 100 years.

2. *Galileo*.—Galileo in about 1590 also ventured to contradict the authority of Aristotle by denying that a heavy body necessarily falls faster than a light one. The famous direct observation of falling balls from the Tower of Pisa apparently led to acceptance of this unorthodox idea fairly quickly and established the modern principle of verification by experiment.

3. *Young*.—Thomas Young in 1801 presented evidence for the wave theory of light. He found it difficult to obtain a hearing because Sir Isaac Newton was cited as favoring the corpuscular theory. Experimental evidence of interference by Fresnel and polarization effects established the wave theory quite firmly.

4. *Mayer, Joule, and Helmholtz*.—The

\* Address of the retiring president at the 455th meeting of the Washington Academy of Sciences, February 16, 1961.



tremendously important theory of the conservation of energy, so fundamental to modern physics, also found acceptance only with difficulty. The theory was first put forth by R. J. Mayer, who in 1842 published an article proposing the equivalence of heat and mechanical energy and calculating a numerical value of the equivalence factor from observed specific heats. No particular attention was given to this paper until 1847, when J. P. Joule and H. Helmholtz independently presented papers with the same conclusion. Helmholtz' paper, presented before the Physical Society of Berlin, was rejected by the editors of *Annalen der Physik* and later published in pamphlet form. However, the theory, once understood, gained rather rapid acceptance and has only rarely been questioned since 1850.

5. *Pasteur*.—In the biological sciences one can point out that the germ theory of Louis Pasteur found strong opposition from the medical profession of his day, which adhered to "spontaneous generation" and other vague ideas. Pasteur calmly performed critical experiments of many kinds and gradually established his point.

6. *Planck*.—At the beginning of the current century, Max Planck was considering the distribution of energy radiated by a perfect emitter ("black body") at various temperatures. In order to obtain agreement with the observed energy distribution, he was forced to make the assumption that the energy of small oscillators could take on only discrete values  $0, h\nu, 2h\nu, 3h\nu$ , etc., where  $\nu$  is the frequency of the radiation and  $h$  a constant. This assumption was completely at variance with classical mechanics, which gives no basis for such a limitation. Naturally it did not receive ready acceptance. However, Einstein's explanation of photoelectric emission in 1905, Bohr's quantum theory of atomic structure with its explanation of the wavelengths of spectral lines in 1913, and finally the experimental evidence of the Compton effect of change of wavelength of radiation on scattering in 1923, provided the bases for full acceptance of the theory.

7. *Blondlot*.—In 1903, at a time when scientists were just becoming familiar with  $\alpha$ -rays,  $\beta$ -rays,  $\gamma$ -rays, and X-rays, a distinguished French professor, R. Blondlot at the University of Nancy, announced the discovery of N-rays<sup>3, 4</sup>. These were said to have remarkable properties, and over 200 papers were published relating to them. They were reported to be emitted by metals, rubber, and many other materials, although never by wood. Some authors reported that they could be refracted and diffracted, and would penetrate black paper, wood, and aluminum.

R. W. Wood, professor at Johns Hopkins University, arranged to visit Blondlot in his laboratory at Nancy in 1904. He found that Blondlot was still observing a spectrum of N-rays after Wood had surreptitiously removed the prism refracting them<sup>4</sup>. This observation, duly reported in German, British, and American scientific journals, dealt a death-blow to N-rays.

8. *Ehrenhaft*.—The accurate measurement<sup>5</sup> of the charge on the electron was one of the most important tasks in physics in the years preceding 1920. An unorthodox position in this field was taken by F. Ehrenhaft of Vienna, who reported measurements on metal particles allegedly bearing charges less than that of a single electron. This "sub-electron" was the subject of controversy for several years, but the careful measurements of R. A. Millikan on oil drops were finally accepted as more reliable.

9. *Klingelfuss*.—A series of unorthodox papers by F. Klingelfuss of Basel<sup>6</sup> were published in 1929 and 1930 in *Zeitschrift für Physik*. From experimental results on the minimum potential required for a spark in air, equations were derived involving various atomic constants. By manipulation of the equations, new fallacious relations were obtained which did not involve the results of the measurements of sparking potentials. From the new equations, values of the atomic constants were calculated to as many as seven significant figures.

10. *Rupp*.—E. Rupp, one of the pioneers

in German research on electron diffraction, published a series of papers in 1934 on the polarization of electron beams, artificially-produced positrons, and related topics. When no other workers could reproduce the results reported, Rupp withdrew the papers after undergoing a psychiatric examination.<sup>7</sup>

11. *Rhine*.—Among unorthodox concepts in psychology, one can scarcely fail to mention the para-psychology and extra-sensory perception experiments conducted over the past 30 years by Joseph B. Rhine and his associates at Duke University.<sup>8</sup> The results of experiments with the naming of unseen cards as they are dealt from a deck are reported to contain far more successful calls than could be expected on the basis of pure chance. The orthodox opinion at present appears to be that the effects are the result of too loose a system of laboratory controls, including the selection of favorable data and even unconscious erroneous recording by workers with a strong belief in extra-sensory perception.

12. *Allison*.—The final example of unorthodoxy which I shall discuss is the magneto-optic method<sup>9</sup> of chemical analysis proposed in 1930 by Fred Allison of Alabama Polytechnic Institute. Minima of light intensity were observed visually as a slider was moved along a set of parallel wires. The minima were said to be correlated with the chemical elements present. The method never gained general acceptance, since observers in other laboratories for the most part were either unable to obtain the minima or unable to correlate them with the elements in solution.

#### IV. Requirements for Acceptance

This survey of examples of unorthodoxy, I hope, has been of some interest and amusement. If it is to be instructive as well, we should examine critically the characteristics of those that have gained acceptance, in order to see whether they possess any common characteristics differing from those of the examples that have failed.

Experimental results must be reproducible without question in other laboratories and by other completely independent observers. In the examples given, the results of Galileo, Pasteur, and Millikan are now routinely repeated in university laboratory courses for instructional purposes. Failure in this respect was the most striking defect of the work of Blondlot, Ehrenhaft, Rupp, Rhine, and Allison.

All of the experimental results obtained under given conditions must be retained. The discarding of certain results without adequate independent cause gives the data a statistical bias which is seldom sufficiently appreciated.

Experimental results without any reasonable theory or explanation of mechanism may be quite valid, but one should be suspicious of such work. This lack was evident in the work of Blondlot, Ehrenhaft, Rhine, and Allison.

Where the work has been primarily the development of a theory, it must be consistent with all the known experimental facts. This may be called the requirement of absolute intellectual honesty. Copernicus, Galileo, Young, Pasteur, and Planck disregarded none of the available experimental information in formulating their theories.

In conclusion, I think that we should be prepared to scrutinize carefully new ideas and results with particular attention to the factors just mentioned. With the elimination of the unacceptable instances, we may well expect the accomplishment of significant scientific advances by those individuals who are willing to display unorthodoxy in science.

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<sup>5</sup> Millikan, R. A., *The Electron*. University of Chicago Press, Chicago (1924).

<sup>6</sup> Klingelfuss, F. Z. Physik 52, 126, 746, and 890 (1929); 53, 154 (1929); 62, 569 (1930).

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<sup>8</sup> Gardner, Martin, *Fads and Fallacies in the Name of Science*. Dover Publications Inc., New York, 1957, p. 299.

<sup>9</sup> Cooper, S. S., and Ball, T. R., The magneto-optic method of chemical analysis. J. Chem. Ed. 13, 210, 278, and 326 (1936).

## General

Hering, Daniel W., *Foibles and Fallacies of Science*. D. van Nostrand, New York, 1924.

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# Academy Seeks Closer Ties With Affiliated Societies

A dinner meeting was held on February 1, to explore means of developing closer relations between the Academy and its affiliated societies. Called by Archibald T. McPherson, 1960 chairman of the Policy and Planning Committee, the meeting was attended by some 17 representatives of the societies. Also present were WAS President Abelson and President-elect Van Evera, as well as Waldo Schmidt, Arnold Sookne, and Bourdon F. Scribner, members of the Policy and Planning Committee.

Four specific proposals for cooperative action were considered:

*Preparation of a Joint Directory.*—Response on the whole was favorable. While some representatives expressed disinterest, the majority favored a joint publication ranging from a listing of officers and functionaries to a directory of the entire membership.

*Establishment of Headquarters.*—The response to this proposal was varied. The smaller societies generally felt they had no need for a central office, but some would like to have mailing facilities provided. A

general need was expressed for storage space for files.

*Increasing Academy Membership.*—As a group, the representatives felt that membership committees have not been sufficiently aggressive. It was suggested that the problem of recruitment is connected with that of increasing the prestige of the Academy. More publicity, particularly for the Academy's work with young people, and improved public relations are required, according to some representatives.

*Promotion of Interdisciplinary Discussions and Meetings.*—The representatives favored panel discussions on problems of national importance and involving several scientific disciplines, seminars of the type held by the New York Academy of Sciences, and the establishment of a list of speakers and subjects to assist affiliated societies in organizing interdisciplinary meetings.

The Policy and Planning Committee would welcome comments from the membership of the Academy on these specific proposals, as well as on other avenues of cooperation between the Academy and its affiliated societies.

# WASHINGTON ACADEMY OF SCIENCES ORGANIZATION FOR 1961

## Officers

<i>President</i>	PHILIP H. ABELSON	Geophysical Laboratory
<i>President-Elect</i>	BENJAMIN D. VAN EVERA	George Washington University
<i>Secretary</i>	HEINZ SPECHT	National Institutes of Health
<i>Treasurer</i>	NORMAN F. BRAATEN	Coast and Geodetic Survey
<i>Archivist</i>	UNAPPOINTED	
<i>Custodian</i>	HARALD A. REHDER	National Museum
<i>Representative on AAAS</i>	HOWARD A. MEYERHOFF	Scientific Manpower Commission

## Managers

<i>Term through</i>		
1961	LEO SCHUBERT	American University
1961	HOWARD S. RAPPLEYE	
1962	WILLIAM G. BROMBACHER	National Bureau of Standards
1962	AUREL O. FOSTER	Department of Agriculture
1963	ALPHONSE F. FORZIATI	National Bureau of Standards
1963	HERBERT FRIEDMANN	National Museum

## Standing Committees

### Executive Committee

PHILIP H. ABELSON (Chairman)	Geophysical Laboratory
HEINZ SPECHT	National Institutes of Health
BENJAMIN D. VAN EVERA	George Washington University
NORMAN F. BRAATEN	Coast and Geodetic Survey
JOHN L. TORGESEN	National Bureau of Standards

### Meetings Committee

FRANCOIS N. FRENKIEL (Chairman)	David Taylor Model Basin
BOURDON F. SCRIBNER	National Bureau of Standards
DEWITT STETTEN, JR.	National Institutes of Health
MARY L. ROBBINS	George Washington University Hospital
FRANK T. MCCLURE	Applied Physics Laboratory
PAUL H. OEHSE	Smithsonian Institution
ALFRED E. BROWN	Harris Research Laboratories

### Membership Committee

MARY L. ROBBINS (Chairman)	George Washington University Hospital
(Roster not complete.)	

### Committee on Monographs \*

DEAN B. COWIE (Chairman)	Department of Terrestrial Magnetism
* A one-man committee in 1961.	

### Committee on Awards for Scientific Achievement

(Chairman and committee members not yet appointed.)

Committee on Grants-in-Aid for Research \*

ARCHIBALD T. MCPHERSON (Chairman)	National Bureau of Standards
* A one-man committee in 1961.	

Committee on Policy and Planning

Term through	
1963	FRANK L. CAMPBELL (Chairman).....National Research Council
1961	WALDO SCHMITT.....National Museum
1961	PAUL D. FOOTE.....National Bureau of Standards
1962	ARCHIBALD T. MCPHERSON.....National Bureau of Standards
1962	ARNOLD M. SOOKNE.....Harris Research Laboratories
1963	WAYNE C. HALL.....Naval Research Laboratory

Committee on Encouragement of Science Talent

Term through	
1962	ABNER BRENNER (Chairman).....National Bureau of Standards
1961	WILLIAM T. READ.....
1961	HOWARD B. OWENS.....Northwestern High School (Science Supervisor, Prince Georges County)
1962	ROY J. BARKER.....Department of Agriculture
1963	LLOYD N. FERGUSON.....Howard University
1963	ALFRED WEISSLER.....National Institutes of Health

Committee on Science Education \*

Term through June 30	
1961	RAYMOND J. SEEGER (Chairman).....National Science Foundation
1961	ROBERT B. HOBBS.....National Bureau of Standards
1962	JOHN K. TAYLOR.....National Bureau of Standards
1962	HOWARD A. MEYERHOFF.....Scientific Manpower Commission
1963	LEO SCHUBERT.....American University
1963	HERMAN BRANSON.....Howard University

\* The Committee constitutes half of the Joint Board on Science Education.

Special Committees

Committee on the National Zoo

CARLTON M. HERMAN (Chairman)	Patuxent Refuge, Laurel, Md.
KEITH C. JOHNSON	Science Supervisor, D. C. Public Schools
GEORGE W. WHARTON	University of Maryland

The Journal

Editor	SAMUEL B. DETWILER, JR.	Department of Agriculture
Associate Editors	FRANK L. CAMPBELL	National Research Council
	HAROLD T. COOK	Department of Agriculture
	RUSSELL B. STEVENS	George Washington University
	JOHN K. TAYLOR	National Bureau of Standards
Staff Assistant	RICHARD P. FARROW	National Canners Association

(For delegates of affiliated societies, see page 48)



# MARCH MEETING

(456th Meeting of the Washington Academy of Sciences,  
Honoring the Washington Junior Academy of Sciences)

## SUBJECT

*Recent Significant Advances in Science*

## SPEAKERS

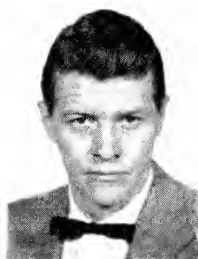
*Biology: Christian B. Anfinsen, Jr., National Institutes of Health*  
*Physics: Joseph Weber, University of Maryland*

## DATE

*Thursday, March 16, 1961, 8:15 p.m.*

## PLACE

*John Wesley Powell Auditorium, Cosmos Club, 2170 Florida Ave., N.W.*



Christian B. Anfinsen, Jr., was born in Monessen, Pa. He received the A.B. degree from Swarthmore College in 1937, the M.S. degree from the University of Pennsylvania in 1939, and the Ph.D. degree in biochemistry from Harvard University in 1943.

For most of the next seven years he served on the faculty of Harvard Medical School, as instructor or professor of biochemistry. In 1950, Dr. Anfinsen joined the National Heart Institute, NIH, as head of the group now known as the Laboratory of Cellular Physiology and Metabolism. His research studies have been particularly concerned with the synthesis and structure of proteins.



A native of Paterson, N.J., Joseph Weber was graduated from the U. S. Naval Academy in 1940, and served as a naval officer until 1948—first on active duty, and after 1945 with the Bureau of Ships in Washington. He began his association with the University of Maryland in

1948, as professor of electrical engineering. In 1951 he received the Ph.D. degree in physics from Catholic University. During 1955-56, Dr. Weber was a Guggenheim fellow at the Institute for Advanced Study, Princeton, and at the University of Leiden. He is currently professor of physics and electrical engineering at the University of Maryland.

## PRESENTATION OF CERTIFICATES OF MERIT

At the general meeting, Academy President Philip H. Abelson will present certificates of merit to 21 high school students of the Metropolitan Area, for their achievements as winners or runners-up in the 1960 National Science Talent Search. These students are:

Thomas G. Andrews, Jr. (Bladensburg), Robert C. Bast, Jr. (Washington-Lee), Martha A. Burns (Immaculata), John M. Cone, Jr. (F. C. Hammond), Leland G. Dobbs (Sidwell Friends), Michael J. Finegan (Fairfax), Dennis W. Herrin (Ancostia), Edward C. Jones (Wakefield), Steven L. Jordan (Montgomery Blair), Margaret E. Kottke (Bladensburg), David H. Malin (Walter Johnson), Rosalie A. McCanner (Woodrow Wilson), David C. Mendelson (Western), Margaret A. Nelsen (Richard Montgomery), Michael C. Newlon (Western), Andrew R. Phelps (Sidwell Friends), Mary M. Shaw (Walter Johnson), Thomas M. Souders (McLean), Barry L. Sperling (McLean), Henry L. Vacher (Western), Robert L. Waymost (Bethesda-CC).

Prior to the general meeting, the students and their science teachers will be guests at a dinner sponsored by the Committee on Encouragement of Science Talent, to be held at the Fairfax Hotel, 2100 Massachusetts Ave., at 6:30 p.m. All members of the Academy who are interested in encouraging science talent are invited to attend.

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors have been assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, care of Agricultural Marketing Service, U. S. Department of Agriculture, Rm. 3917 South Bldg., Washington 25, D. C.*

### APPLIED PHYSICS LABORATORY

**Ralph E. Gibson**, director of the Applied Physics Laboratory, was general chairman of the 14th Annual Conference on the Administration of Research at Ann Arbor, September 18-21, 1960. Dr. Gibson also spoke on September 13 at Williamsburg, Va., at the Brookings Institution Conference for Federal Science Executives; his topic was "Science, Technology and Economic Growth."

**Albert M. Stone**, technical assistant to the director, also attended the 14th Annual Conference on the Administration of Research.

### GEOLOGICAL SURVEY

**Alfred M. Pommer** attended conferences on radioactive waste disposal in Denver, January 9-11.

### NAVAL RESEARCH LABORATORY

**George T. Rado**, head of the Magnetism Branch, presented an invited reportorial talk at the Sixth Conference on Magnetism and Magnetic Materials, November 14-17, 1960, in New York City. His lecture provided an integrated summary of 16 experimental and theoretical papers on ferromagnetic resonance, and constituted the first use of the reportorial system at these Conferences. Under this system, a single talk replaces individual presentations of several papers.

### NATIONAL BUREAU OF STANDARDS

**Arnold M. Bass** is on a research assignment in London under the NBS training program. He is working with W. R. S. Gaston in the Physics Department, Imperial College of Science and Technology, University of London. Dr. Bass is expected to return in July.

### USDA, BELTSVILLE

**Flippo Gravatt**, while on a vacation in Puerto Rico recently, conferred with university and other authorities on the preservation of "Bahia Fosforescente," a world-famous bay displaying luminescence every night of the year. Mr. Gravatt is the Maryland and District of Columbia representative of Nature Conservancy, a national organization. This organization has purchased the famous "Battle Creek Cypress Swamp" and a hemlock forest in southern Maryland and a part of the Crainesville tamarack swamp west of Oakland, Md. Suggestions about other natural areas needing preservation will be appreciated.

**James E. McMurtrey, Jr.**, was awarded a certificate in recognition of his accomplishments and contributions to the promotion of tobacco research at the 17th Tobacco Workers Conference on January 17. He has been associated with these conferences for 45 years. Mr. McMurtrey was one of ten outstanding scientists to be elected to an honorary lifetime membership in the Soil and Crop Science Society of Florida, at its 20th annual meeting on November 29, 1960.

### USDA, WASHINGTON

**Samuel B. Detwiler, Jr.**, Agricultural Research Service, spent November and part of December in India, as a member of a team which negotiated grants for agricultural research with scientific institutions, under the provisions of U. S. Public Law 480 (83rd Congress). His travels took him to New Delhi, Bombay, Madras, Bangalore, Mysore, Poona, Allahabad, and other cities. On leaving India, Mr. Detwiler visited institutions in Karachi, Pakistan, and the Rome office of the ARS foreign grants program.

**Kenneth W. Parker** presented an invited paper, "What's Ahead in Range Research?" at the 14th Annual Meeting of the American Society of Range Management, held at Salt Lake City January 31-February 3.

**Benjamin Schwartz** gave the fall-term biological lecture at the University of Illinois at Urbana, December 1, 1960, on "The Evolution of Knowledge Concerning *Ascaris lumbricoides*." On January 12, he gave an illustrated lecture at USDA on "Trichinosis and Its Control—A Century of Progress."

For the past few months Dr. Schwartz has served as consultant parasitologist to the Meat Inspection Division.

### UNCLASSIFIED

**Victor Hicks** has been appointed staff scientist of the Military Department of Remington Rand Univac. He was formerly manager of the physics laboratory of Allen Bradley Company. Dr. Hicks holds the rank of rear admiral in the U. S. Naval Reserve.

## AFFILIATED SOCIETIES

*In a number of instances, information on the specific program scheduled for meetings of affiliated societies is not available sufficiently in advance to be included in the Calendar of Events. Where possible, therefore, this material will be carried as a news event in the next issue of the Journal in the commentary concerning the society in question.*

### **Acoustical Society of America, Washington Chapter**

On February 20, Alfred Weissler spoke to the chapter on "Ultrasonic Cavitation as a Cause of Chemical Change."

### **American Institute of Electrical Engineers, Washington Section**

Howard Mitchell, conductor of the National Symphony, discussed on February 14 some of the technical problems involved, from the artist's viewpoint, in the production of live and recorded orchestral music.

The first Precision Measurement and Standards Meeting, held February 21 in cooperation with several related professional groups, presented J. Cameron and A. G. McNish, of NBS, on "Propagation of Error in a Chain of Standards."

The Transportation, Industry, and Management Division on February 13 heard Lowell H. Hattery, American University, speak on "Computers and Management." A meeting scheduled for March will consider "Basic Concepts of Sound System Applications."

In the Power Division, chairmen and secretaries of the four technical groups concerned have been selected. A general discussion was held on January 24 to consider future plans and programs.

Two technical discussions have been conducted by the Science and Electronics Division—one on "Thermoelectricity" by William Lucke of the Naval Research Laboratory, and another in the area of computers.

### **American Society of Civil Engineers, National Capital Section**

Robert Z. Page, Bureau of Yards and Docks, pointed out in a talk on "Some Contributions of Biological Sciences to Engineering" that activities of various living organisms not infrequently complicate and frustrate the efforts of the civil engineers, and supported his thesis with two recently prepared films. In addition, the recipient of the student fall award, Michael A. Czachor of Catholic University, gave a brief paper on "Hyperbolic Paraboloids in Construction."

Student chapter meetings were held at Georgetown University on February 2 and at Howard University on February 14 and 28.

### **American Society of Mechanical Engineers, Washington Section**

The jointly sponsored lecture on "Propagation of Error," noted above, was originated by the

George Washington University Center for Measurement Science, newly established in collaboration with the Bureau of Standards and with financial support from the Martin Company of Baltimore. The Center serves to train personnel in measurement techniques and to conduct research on measurement problems, and as a service organization. An Associates Program, comprising individuals, governmental and non-governmental agencies contributing support to the Center, provides the necessary linkage with industry and other consumers.

The February 23 meeting included an address by James Dickson, Allis Chalmers Company, on "Ingredients Required in Building a Nuclear Power Reactor."

Current interest in science and engineering education suggests that additional comment on Paul F. Chenea's December talk would be appropriate. On this occasion he pointed out the need for a curriculum that recognizes the trend to research in industry, and that more and more engineering problems cut across two or more of the traditional engineering specialties. Industry increasingly regards very large expenditures for computers as valid in replacing engineers themselves, particularly when it means dramatic reductions in design lead time. Publicity given to what he called "scientific successes" and "engineering failures" is steering certain students from engineering into science, a movement heightened by changes in the high school physics course itself. Dr. Chenea felt that the professional content of the undergraduate curriculum was under deep scrutiny, that almost none of the modern instrumentation was to be found at the undergraduate level, that engineering education beyond the B.S. degree was increasingly in demand, and that attention must be given to upgrading of faculty competence.

### **Botanical Society of Washington**

At its most recent meeting, the Society heard Louis B. Baron, Walter Reed Army Institute of Research, on "Sexual Behavior and Mechanisms in Bacteria." Dr. Baron was the recipient of this year's Academy award in the biological sciences.

### **Chemical Society of Washington**

At a Board of Managers meeting on January 12, supplementing the meeting of January 10, two new special committees were established: a committee on tellers, which would be active during the nomination and election of officers, and a committee on long range planning, which would comprise all councilors in the area including national Division councilors, and would serve in an advisory capacity to the Board.

Future Board meetings will be held on special call, rather than prior to general meetings of the Society, as in the past. Each general meeting will, however, be preceded by a dinner open to all members.

The formation of topical groups within the Society will be discussed at future Board meetings.

At the Society's general meeting on January 12, Allen L. Alexander, retiring president, spoke on "Recent Research in Functional Organic Coatings." At the general meeting on February 9, held jointly with the Washington Junior Academy of Sciences, John Turkevich of Princeton University spoke on "The World of Fine Particles."

#### **Entomological Society of Washington**

Roman Vishniac, of the Living Biology Film Series, spoke at the January meeting and showed motion pictures of insects and other animals in their natural habitats.

In a related area, it might be noted that Colin G. Butler of the Rothamsted Experimental Station, England, visited the University of Maryland early in January and lectured on "Interattraction among Members of a Honeybee Community." Dr. Butler, who is in this country under the AIBS Foreign Visitors Program, is well known for his discovery of the so-called "queen substance."

#### **Geological Society of Washington**

Three papers were given at the January 25 meeting, as follows: John C. Goodlett, "Plant Distribution and Pollen Analysis"; Thor H. Küllsgaard, "Ore Deposits of Southern Peru"; and W. H. Bradley, "Geochemical Balances in the Green River Formation of Wyoming."

On February 8, R. E. Wallace, N. J. Silberling, and D. B. Tatlock discussed "Some Structural Features of the Humboldt Range, Nevada"; W. T. Pecora spoke on "Origin of Carbonatites, Bearpaw Mountains, Montana"; and L. C. Pakiser, Jr., D. P. Hill, and H. L. Baldwin considered "Gravity Anomalies in Volcanic Regions of the Southern Cascade Range, the Snake River Plain, and Yellowstone National Park."

#### **Helminthological Society of Washington**

The 377th meeting was held jointly with the Howard University Chapter of Sigma Xi on February 17, at which time five members of the Department of Zoology presented papers. Neville K. Rajapaksa reported on the reproductive capacity of *Argas persicus* after starvation; and D. R. Lincicome, Jacqueline A. Shepperson, E. H. Francis, and Anna L. Cherrie gave data on various aspects of *Trypanosoma* in experimental animals.

#### **Insecticide Society of Washington**

On February 15, Price C. Piquett, USDA, spoke on "Chemical Inhibition of Gonadal Development in Insects," and Martin Jacobson, also of USDA, on "What is Known about Juvenile Hormones."

#### **Institute of Radio Engineers, Washington Section**

At the Section meeting on February 13, William C. Coombs, National Bureau of Standards, showed

how, in "Digital Television," a way is opened to encoding techniques which are in line with modern communications theory, and demonstrated methods for achieving fidelity in the picture without undue expansion of the band width. Non-classified aspects of recent Government television developments were made available.

Advance notice has appeared of the Second National Symposium on Human Factors in Electronics, scheduled for May 4 and 5 at the Marriott-Twin Bridges Motor Hotel in Arlington. This Symposium is sponsored by the national Professional Group in this area of concern.

Professional Group Chapter activities include programs on "TEM Diode Switching," February 7; "The Psychology of Selling Ideas to Management," January 30; and "The Determination of the Thermodynamic and Electrodynamical Constants of the Surface of the Moon," February 21.

#### **International Association for Dental Research, Washington Section**

On February 20, Meyer Rubin of the Geological Survey addressed the Section on "C<sup>14</sup> Dating and the New Frontier," and in so doing showed how low-level counts have become increasingly difficult as all materials become radioactively contaminated, with comments on techniques developed to overcome these difficulties. In another paper, Comdr. G. H. Rovelstad, Naval Dental School, spoke on "Salivary Corpuscles"—leucocytes recently shown to be present in the oral cavity in large numbers.

#### **Medical Society of the District of Columbia**

Space limitations completely rule out its reproduction here, but Washington scientists should be aware of the monthly publication, by the Medical Society, of a *Current Medical Events* leaflet. The February issue lists more than 40 events of medical interest, the great majority of which are open to interested individuals without restriction.

#### **Philosophical Society of Washington**

The 1503rd meeting of the Society, January 27, presented R. V. Pound, of Harvard University, in a paper on "Laboratory Measurements of the Gravitational Red Shift."

#### **Society for Experimental Biology and Medicine, District of Columbia Section**

On February 2 a joint meeting was held with the Md-Va-DC Chapter of the American Association of Clinical Chemists. A series of four papers was arranged: Robert Scow, NIH, "Fat Metabolism in Experimental Diabetes"; Edward C. Knoblock, Walter Reed, "Cholesterol and Lipoproteins Following Radiation Injury"; Abel M. Domiguez, Armed Forces Institute of Pathology, "Biochemical Approach to Determination of Antemortem Hypoxia"; and James Field, NIH, "In Vitro Stimulation of Glucose Oxidation in Thyroid by Thyroid Stimulating Hormone."



The Section, as have several affiliated societies, reports approval by its members of a contribution to the work of the Joint Board on Science Education.

#### **Society of American Military Engineers, Washington Post**

On February 20, the Post scheduled a talk by Harry Lowe, Jr. on "Extra Terrestrial Construction."

## **CALENDAR OF EVENTS**

*Events which, so far as we can determine at the time of writing, will take place subsequent to the appearance of the Journal are noted below. Where possible, the nature of the program is indicated; in most instances the entry merely notes the date and place of a regularly-scheduled meeting of the organization in question. Last-minute changes in time and place, or emergency cancellations, may in certain instances alter the situation.*

#### **March 6—American Institute of Electrical Engineers, Washington Section**

Telemetry and Instrumentation Division (postponed from December)—Robert Hart, Barth Engineering and Manufacturing Company, "Dynamic Simulation of Telemetry Signals."

PEPCO Auditorium, 8:00 p.m.

#### **March 7—American Institute of Electrical Engineers, Washington Section**

Student Night meeting, originally scheduled for March 14. Dinner meeting at Catholic University, followed by a play staged by the Catholic University Speech and Drama Department.

#### **March 7—Botanical Society of Washington**

Meets with staff members of the Smithsonian for a presentation of the research program in plant science at that institution.

#### **March 8—American Society of Mechanical Engineers, Washington Section**

Third Annual Banquet, Terrace Banquet Room, Shoreham Hotel. Speaker will be John H. Rubel, Office of the Secretary of Defense, "Rising Costs of Research and Development."

#### **March 8—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

#### **March 9—Chemical Society of Washington**

Annual Hillebrand Award dinner and lecture. Guest of honor: Frank T. McClure, Applied Physics Laboratory. Tickets: \$3.50.

National Housing Center, 1625 L St., N.W., 7:30 p.m.

#### **March 10—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

#### **March 13—American Society for Metals, Washington Chapter**

Dwight Brown, Jones and Laughlin Steel Company, "Direct Reduction of Iron Ore."

AAUW Headquarters, 2410 Virginia Ave., N.W.

#### **March 14—Institute of Radio Engineers, Washington Section**

Professional Group on Microwave Theory and Technology.

#### **March 15—American Society of Civil Engineers, National Capital Section**

Annual Dinner, Shoreham Hotel. Cocktails, 6:00; dinner, 6:45; program, 8:00 p.m. National President Glen Holcomb will present life memberships to 12 members.

#### **March 15—Insecticide Society of Washington**

Symons Hall, University of Maryland, 8:00 p.m.

#### **March 15—Washington Society of Engineers**

John Wesley Powell Auditorium, 8:00 p.m.

#### **MARCH 16—WASHINGTON ACADEMY OF SCIENCES**

#### **March 16—Society of American Foresters, Washington Section**

YWCA, 6:30 p.m.

#### **March 17—Institute of Radio Engineers, Washington Section**

Arthur G. Norris, Vitro Engineering, "The Peaceful Do-existence of Engineers and Writers." U. S. National Museum, 8:00 p.m.

#### **March 20—Acoustical Society of America, Washington Chapter**

Gallaudet College, 8:00 p.m.

#### **March 20—Society of American Military Engineers, Washington Post**

YWCA, 17th and K Sts., N.W., noon.

#### **March 21—Anthropological Society of Washington**

Richard Jessor, University of Colorado, "A Social Learning Approach to Culture and Behavior."

U. S. National Museum, Room 43, 8:15 p.m.

#### **March 21—Institute of Radio Engineers, Washington Section**

Joint meeting of professional groups on Instrumentation and on Space Electronics and Telemetry.

#### **March 22—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

#### **March 23—American Society of Mechanical Engineers, Washington Section**

General meeting, elections.

PEPCO Auditorium, 8:00 p.m.



### **March 23—Institute of Radio Engineers, Washington Section**

Professional Group on Antennas and Propagation.

### **March 24—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

### **March 28—American Society of Civil Engineers, National Capital Section**

Luncheon meeting, YWCA, 17th and K Sts., N.W., noon.

### **March 28—Society of American Bacteriologists, Washington Branch**

A. C. Sanders, M. J. Pelczar, Jr., and Susan Chapman, Walter Reed Army Institute of Research and University of Maryland, "The Synergistic Role of *Staphylococcus* in 'penicillin-resistant' gonorrhea"; and H. E. Hopps, J. L. Showacre, and J. E. Smadel, NIH, "Intracellular Infection of Tissue Culture Cells with *Salmonella typhosa*."

Sternberg Auditorium, Walter Reed Army Institute Center, 8:00 p.m.

### **March 30—Society for Experimental Biology and Medicine, District of Columbia Section**

Gorman Auditorium, Georgetown University Medical Center, 8:00 p.m.

## **ACADEMY ACTIVITIES**

### **JANUARY BOARD MEETING**

*The following notes are for the timely information of the membership; they are not the official minutes of the meeting.—Ed.*

The Board of Managers held its 534th meeting on January 17 at NBS, with President Wood presiding. The following were present: William G. Allen, Carl I. Aslakson, Gerhard M. Brauer, William G. Brombacher, Samuel B. Detwiler, Jr., Aurel O. Foster, Francois N. Frenkiel, Wayne C. Hall, Regina F. Herzfeld, Keith C. Johnson, Mary L. Fell, Kathryn Knowlton, Archibald T. McPherson, Howard S. Rappleye, Harald A. Rehder, Raymond J. Seeger, Doys A. Shorb, Heinz Specht, Jack C. Thompson, Benjamin D. Van Evera, and Lawrence A. Wood.

Dr. Wood spoke briefly of his appreciation for the work of the Board during 1960, then asked for the annual reports of standing committees.

In the absence of Dr. Stiehler, the report of the Meetings Committee was presented by Dr. Wood. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Hall presented the report of the Membership Committee. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Hall also gave the first reading of eight nominees for membership.

Dr. Wood referred the Board to the final report of the Awards Committee presented at the meeting of December 20. (See December meeting notes in the February *Journal*, page 24, also the story, "Academy Presents Awards to Six," on page 11 of the same issue.)

Dr. McPherson presented the report of the Policy and Planning Committee. (See abstract of report elsewhere in this issue.) The report was accepted.

Because of the illness of Dr. Schubert, Dr. Wood presented the report of the Committee on Encouragement of Science Talent. (See abstract of report elsewhere in this issue.) The report was accepted.

Dr. Van Evera presented the report of the Committee on Grants-in-Aid for Research. (See abstract of report elsewhere in this issue.) The report was accepted.

In the absence of Dr. Seeger, Dr. Wood pointed out that a report of the Committee on Science Education concerning Joint Board activities, prepared in July 1960 by John K. Taylor, had previously been distributed. (The Committee and the Joint Board are appointed for the fiscal year beginning July 1.) The report was accepted.

Mr. Johnson commended the Committee on Science Education and the Joint Board for their help to the metropolitan area schools. Dr. McPherson pointed out that the Washington Academy leads all the academies of the United States in improvement of science education.

Following the second reading of their names by Dr. Hall, 22 persons were elected to membership in the Academy, as follows: Wendell L. Anderson, Mortimer C. Bloom, Carl R. Brewer, James W. Butler, Homer W. Carhart, James M. Cassel, Irvin L. Cooter, Jules R. de Launay, Joachim B. Ehrman, Richard P. Farrow, Robert G. Glasser, Harry D. Holmgren, Billy M. Horton, Charles H. Klute, Paul E. Landis, Helen D. Park, Maynard J. Pro, Edward J. Schremp, Max Tryon, John P. Vinti, Walter W. Wada, and Carl H. Walther.

Dr. Specht submitted the secretary's annual report, which was accepted. (See February *Journal*, page 19.)

Captain Aslakson submitted the treasurer's annual report, which was accepted. (See abstract in February *Journal*, page 18.)

Speaking for the *Journal*, Mr. Detwiler commented that the 1960 volume constitutes its own report of accomplishment. He pointed out that the quality of any issue of the *Journal* and its cost are closely linked together. Also, he noted that he is attempting to get each issue into the mails in advance of the Academy meeting, in order that it may be used as an encouragement to the members—by way of a monthly meeting page—to attend the meetings.

Dr. Seeger having arrived at the meeting, he discussed the situation of the Committee on Science Education and the operation of the Joint

Board. He pointed out that the Board had turned into an operating group rather than a sponsoring and directing group, and that this could not continue. He announced that a Committee had been set up to inquire into proper activities for the Joint Board on a long-range basis.

Dr. Wood then addressed himself to the Board as retiring president. (See his remarks in the February *Journal*, page 9.) He expressed appreciation of the fine work of committee chairmen and appointees, and the cooperation of all involved in the Academy's administration.

## ABSTRACTS OF ANNUAL REPORTS OF STANDING COMMITTEES

### *Committee on Meetings*

The Committee met twice during the year and arranged eight meetings, all held in the John Wesley Powell Auditorium at 2170 Florida Avenue. The 447th meeting was held on February 18, 1960; the 448th, on March 17; the 449th, on April 21; the 450th, on May 19; the 451st, on October 20; the 452nd, on November 17; the 453rd, on December 15; and the 454th, on January 19, 1961. (For names of speakers and their topics, see secretary's annual report in February *Journal*, page 19.)

The attendance at meetings ranged from a low of 15 at the meeting of December 15 to about 200 at the jointly-sponsored meeting of November 17. The meeting of October 20 had an attendance of over 130, and was the largest of those sponsored solely by the Academy.

The weather and lack of notices to members contributed to the low attendance at the 453rd meeting. Nevertheless, the 449th and 450th meetings also were poorly attended, with less than 50 persons present. On the other hand, the enthusiastic reception of the jointly-sponsored meetings indicates that more meetings of this type should be held.

The local section of the American Meteorological Society was not in a position to co-sponsor the meeting of December 15. However, the section would like to hold a joint meeting with the Academy during 1961, since the last joint meeting was over five years ago.

### *Committee on Membership*

This was the second full year of operation under a system whereby each Committee member except the chairman served on a panel of six scientists (members of the Academy) which reviewed nominations to the Academy of individuals active in particular areas of science. Under this procedure, nominations were routed by the general chairman to the proper panel chairman for action of the panel. Generally, nominations were mailed from member to member within the panels. Then, on the first Wednesday evening of each month, the Membership Committee proper met to discuss its work and complete action on the nominations which had been reviewed by the panels. The

system seemed to work quite satisfactorily, although it seemed to be a bit slow in overall response. Of the 100 nominations handled by the Committee in 1960, 83 were elected to the Academy; 5 are still within the Committee; 3 were rejected; 1 was referred to the Board of Managers for action; and 8 were to be submitted to the Board for first reading on January 17. For comparison with the previous year, between 15 and 20 percent more nominations were reviewed by this Committee than by the previous one.

There are several matters which may need to be considered by future Membership Committees. For example, under the present setup involving panels, there is no specific provision for handling nominations of scientists who are primarily in administrative posts, or teaching posts. Therefore, such nominees must be considered by the Membership Committee itself. This situation has not led to any particular difficulties, since the candidates with these qualifications have been few in number. No change in the present setup is recommended.

Another and more important matter has to do with the action to be taken on certain recommendations of the Awards Committee. The last two chairmen of that Committee have submitted reports in which selected, unsuccessful nominees for awards were recommended for membership. Since the examination by the Awards Committee of the qualifications of a candidate is more than adequate to assess these qualifications, it is not believed necessary for the Membership Committee to subject these candidates to further examination and review . . . It is recommended that in future, when the Awards Committee makes positive recommendations for the election of suitable candidates, the following procedure should be observed: The Awards Committee should submit to the Board of Managers, with copies to the Membership Committee, one-paragraph statements regarding the qualifications and other pertinent information concerning the candidates, together with the statement that the Awards Committee members are the sponsors for the nominations; the respective citations should also be included. Then the action to be taken by the Membership Committee need be only to determine whether the nominee actually desires election. When this information has been obtained, it can be forwarded to the Board of Managers, together with the recommendation of the Membership Committee. In the case of those candidates who desire election to the Academy, the action of the Membership Committee would be expected to endorse that of the Awards Committee, or give reasons for a different view.

### *Policy and Planning Committee*

The Committee reviewed a new draft of the Standing Rules of the Academy and recommended to the Board that they be adopted, with minor revisions.

The Committee considered a proposal to establish a new Academy award in the earth sciences or earth and space sciences. It recommended that such an award not be established, but instead, that two awards be given in any of the present fields in which there are unusually well-qualified candidates.

The major activity of the Committee is unfinished. This concerns the promotion of closer relations between the affiliated societies and the Academy, in order that the Academy may be of greater service to the individual societies, their membership, and the scientific community of Washington. To further these objectives, a dinner conference has been planned to be held at the Cosmos Club on February 1, at which the following topics will be discussed: (1) Preparation of a joint directory similar to the 1947 directory; (2) a look ahead toward the establishment of a central headquarters for the Academy and the larger affiliated societies; (3) increase in Academy membership; and (4) promotion of interdisciplinary discussions and meetings. (See report of this meeting, elsewhere in the present issue.)

#### *Committee on Encouragement of Science Talent*

The Committee was very active in 1960, particularly as concerns its work with the Washington Junior Academy of Sciences. In this field, several categories might be considered:

(a) Monthly meetings were held by the WJAS Governing Council, in which Committee members participate. These meetings were, on the whole, well attended and considerable business was transacted.

(b) The Committee and WJAS again were prime movers in local science fairs. The science fairs this year were larger than any in the past: WJAS contributed \$1,000 to their support.

(c) The Committee acted in behalf of the Science Talent Search; in particular, local winners were selected and honored for outstanding scholarship at a joint meeting of WJAS and the senior Academy on March 17.

(d) The Committee helped organize the science trips to Philadelphia last fall. A total of 3,714 students participated in the five trips that were arranged; over \$2,500 was realized by this project.

(e) The system of area councilors, devised in 1959, worked very well in 1960. Each of the areas had an active representative.

(f) Much work has gone into new selection procedures for membership in WJAS. Some of us have been disturbed that election to WJAS was based only on science fair competition. The new procedure makes it possible for others, such as those who are active in school science clubs, to be elected.

(g) A special meeting of all science club presidents in the area was held on December 17. Over 125 people attended, including science club presidents, WJAS members, scientists, and educators.

It is hoped that this will augur well for increased liaison between WJAS and science clubs of the individual schools, and for strengthening the science club movement.

(h) The Committee and WJAS sponsored the second Science Conference, held December 29 at an all-day session in the Ambassador Hotel. Some 25 papers were read by students in divided meetings. The Conference was an unqualified success.

The Committee sponsored an interesting summer research program. In this program, 15 selected students were given the opportunity to work without remuneration at the National Institutes of Health; they were given \$10 a week to meet their expenses. Based on this experience, the Committee has proposed to the National Science Foundation that it finance a similar program for the summer of 1961.

#### *Committee on Grants-in-Aid for Research*

In 1960, as in 1959, there was a minimum of activity by this Committee. Three applications for funds were received, of which two were recommended by the Committee and granted by the Board.

John Budlong of McLean High School received a grant of \$50.00 to aid in an experiment on determining the velocity of light. On his own, Budlong had made arrangements to use facilities of the telephone company, including the roof of its building and one of its towers for reflection purposes. After Budlong had purchased the parts for the equipment he needed and had it all calibrated, vandals destroyed a good part of it. In the time that remained, using his salvaged equipment, he switched the experiment to one on the velocity of sound, in which he did an exceedingly good piece of work. He was awarded a first place in the Northern Virginia Science Fair; because he had already spent an excessive amount of time on the project, he did not compete in other fairs.

Michael Finnegan received a grant of \$55.80 for chemicals to be used in a study of chromic acid oxidation through the synthesis of o-nitro acetophenone from o-ethyl nitrobenzene.

William Burchaell of Fairfax, who received a grant of \$92.00 at the end of 1959 to buy supplies for a chromatographic study of amino acids in the thyroid, reports that he entered his project in five science competitions and received the following awards:

(1) Second place in senior biochemistry, Fairfax High School Science Fair.

(2) First place in 11th grade chemistry, Northern Virginia Science Fair.

(3) First place in chemistry, University of Virginia Science Open House (award by Society of the Sigma Xi).

(4) Second place (\$50 award), Randolph Macon Science Competition. (Judging was on an overall basis, with no categories for age, grade, or field of project.)

(5) First place in chemistry (\$50 award).

Virginia State Science Fair, sponsored by the Virginia Junior Academy of Science.

The recommendations of last year's Committee are repeated here: (1) The Committee should consist of a single individual; (2) each grant request should be referred to a scientist competent in the subject field, who would interview the student to determine the value and feasibility of the proposal; (3) it should be emphasized that the purpose of the grants is to assist students in their research, not primarily to help them prepare for a science fair project; (4) any project should involve some research; (5) the funds should be for the parts out of which equipment can be made, rather than the equipment itself; (6) as an aid to the Committee chairman, the directory of the Washington Academy should list the field of interest of each member.

## JOINT BOARD ON SCIENCE EDUCATION

The annual Engineers, Scientists, and Architects Day Luncheon held at the Presidential Arms in Washington on Thursday, February 23, was the occasion for the presentation of Distinguished Teacher Awards to 12 local elementary, junior high, and senior high school teachers. In addition, 52 other teachers received citations for outstanding teaching of science and mathematics.

Engineers, Scientists, and Architects Day was established several years ago to honor and call public attention to the contributions of these professions to human progress. Because of the prime importance of good teaching to technologic advancement, it seemed proper to use this occasion to honor outstanding teachers. Accordingly, the Joint Board on Science Education in 1958 established the Distinguished Teacher Awards. From nominations submitted by the school principals, 12 are selected for the Award. An unspecified number of the nominees are selected on the basis of very meritorious commendation to receive a citation.

The Award consists of an engrossed certificate and personalized copies of the Smithsonian Treasury of Science, as well as the *Scientific American* Science Project Book. The others receive certificates of citation. All are honored guests of the Joint Board at the ES&A Day luncheon.

Distinguished Teaching Awards were presented to: Helen B. Arni, Westlawn Elementary School (Fairfax); Ruth H. Bauer, Northwestern H. S. (Prince Georges); Sister Mary Blanch, Immaculata H. S. (D.C.); Thomas H. Christie, Washington-Lee H. S. (Arlington); Lucille T. Freeman, Monroe Elementary School (D.C.); Dale E. Gerster, Bladensburg H. S. (Prince Georges).

Also, George A. K. Jones, Glasgow Intermediate

School (Fairfax); Alfred C. Rogan, Northwood H. S. (Montgomery); Ephraim G. Salins, Springbrook H. S. (Montgomery); Grace H. Smith, LaSalle Laboratory School (D.C.); John M. Winters, Sherwood Jr.-Sr. H. S. (Montgomery); Robert L. Wistort, High Point H. S. (Prince Georges).

Certificates of citation were presented to the following:

From the District of Columbia—Josephine A. Berkey, Kramer Jr. H. S.; Carolynne G. Branson, Terrell Jr. H. S.; Mrs. Howland M. Caple, Shodd Elementary; Rev. John A. Coughlan, Archbishop Carroll H. S.; Louise A. Dickson, Anacostia H. S.; Edna K. Dodge, Hearst Elementary; Betty B. Francisco, Brightwood Elementary; Hilda Jecklin, Calvin Coolidge H. S.; Grace E. McDowell, Garnet-Patterson Jr. H. S.; Jean McGregor, McKinley H. S.; Bessie Pinner, Shaw Jr. H. S.; Annie T. Reid, Hine Jr. H. S.; Rev. Floyd Schulze, Mackin H. S.; Mrs. Hollie C. Tillinghast, Miller Jr. H. S.; Virginia E. Tyler, Lafayette Elementary; Opal D. Weida, Ballou H. S.; Judith S. Wescott, Macfarland Jr. H. S.; Howard S. White, Taft Jr. H. S.; Jane K. White, Janney Elementary.

From Arlington County—Felix Blackwood, Jr., Hoffman-Boston H. S.; Donald Buttermore, Gunston Jr. H. S.; Patricia J. Custer, Jefferson Jr. H. S.; Ione B. Surret, Williamsburg Jr. H. S.; Simeon Taylor III, Yorktown H. S.; Walter Taylor, Hoffman-Boston H. S.; Cornelius Van Scott, Nottingham Elementary; Gilmer Weatherly, Wakefield H. S.

From Fairfax County—Sadie Bruin, Herndon Elementary; Deloris G. Evans, James Lee Elementary; Emmett A. Hutcheson, Jr., Glasgow Intermediate; Marie Jones, Belvedere Elementary; Russell G. Kerlin, Jr., Longfellow Intermediate; Mary M. Moore, Crestwood Elementary; Herbert P. Rice, J. E. B. Stuart H. S.; Mary W. Stine, Groveton H. S.

From the city of Falls Church—Dorothy Moore, Jefferson Elementary.

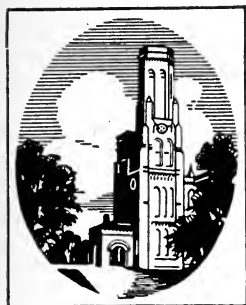
From Charles County—W. Edward Lakes, La Plata Jr. H. S.

From Montgomery County—Charles C. Amtower, Newport Jr. H. S.; Mrs. Adnah J. Berthright, Takoma Park Jr. H. S.; Mrs. Francis R. Borders, Wyngate Elementary; Martha H. Green, Rock Terrace Elementary; Patricia L. Johnson, Belt Jr. H. S.; Agnes M. Nachman, Kensington Jr. H. S.

From Prince Georges County—Barbara Anne Creegan, West Lanham Hills Elementary; Elizabeth Erling, Glenridge Jr. H. S.; Joyce Harris, Adelphi Elementary; Clifford Hersey, Surrattsville H. S.; Barrett L. McKown, Suitland H. S.; James M. Skidmore, Laurel Jr. H. S.; Frances Wells, District Heights Elementary.



## THE BROWNSTONE TOWER



On October 26, 1951, I had occasion to visit the laboratories of the Arthur D. Little Company in Cambridge, Mass. While there I was taken to the roof of the building to see an unusual pilot plant for the continuous production under sunlight of large quantities of a microscopic,

unicellular alga of the genus *Chlorella*. The Company's purpose was to determine the feasibility of growing *Chlorella* economically for use as a food or food supplement for man or animals. Theoretically, the *Chlorella* farmer would need only a recirculating system for an aqueous, carbon-dioxide-enriched, nutrient medium that would permit optimum growth and reproduction of these cells under sunlight. And he would need means of maintaining the desired concentration of the medium while continuously harvesting cells uncontaminated by other microorganisms. Then he would centrifuge or filter and dry the cells and market the resulting dry green powder. Or the chlorophyll could be extracted and the dry powder marketed without it. One could easily imagine an automatic process in which nutrient materials and carbon dioxide would be added at one point and dry *Chlorella* powder would be bagged for shipment at another. I really thought *Chlorella* was "in the bag" at that time. To be sure, it tasted like grass to me, but I supposed it would be a simple matter to disguise or mask its disagreeable flavor, especially if it were used as a food supplement.

On February 6, 1961, almost ten years later, I learned that *Chlorella* is not ready for commercial production. My informant is one of the brilliant younger investigators in the Washington area—Robert W. Krauss, professor of plant physiology at the University of Maryland and a member of the Washington Academy of Sciences. I visited him in his office on the third floor of H. J. Patterson Hall, toured his laboratories, and had lunch with him and his colleague, R. A. Galloway, at the University's Faculty Club. I did not see his research associate, Constantine Sorokin, but observed his work on a strain of *Chlorella* that grows best at 39° C.

Bob Krauss has been working on the physiology of algae since he was a predoctoral student at the University of Maryland in 1949-51. He came to the University to study with Hugh G. Gauch, and he himself proposed to Professor Gauch that he investigate the inorganic nutrition of algae, not because of its practical value, for he was not then

aware of it, but because the subject excited his curiosity. Dr. Gauch and Ronald Bamford, chairman of the Department of Botany and dean of Maryland's Graduate School, approved Bob's project and helped him procure what he needed to do the work. In the last ten years he has become an authority on his subject, and his laboratory is recognized as one of the leading centers of study in this field.

Bob became aware of the possibilities of *Chlorella* farming while he was still a graduate student. He told me that during World War II, H. A. Spoehr and H. W. Milner, of the Carnegie Institution's Department of Plant Biology at Palo Alto, Calif., had looked for antibiotics in algae without much success but had found something else that seemed to have practical possibilities; namely, the fact that the chemical composition of the cells was subject to wide variation depending on the composition of the medium. Thus one could at will produce cells high in protein, fat, or carbohydrate. Vannevar Bush, then director of the Carnegie Institution, saw possibilities of producing needed food substances in a new and efficient manner. Bob Krauss was already studying factors affecting the mass culture of certain algae and, remaining at the University of Maryland, he became a research fellow of the Carnegie Institution, which, together with the Office of Naval Research, supported his research for several years. But Bob never allowed himself to be diverted from basic research to the development of the production of algae for food. He felt that there was much to learn about the physiology of these algae before engineering research could be intelligently applied to them, and he believes that is still true today. *Chlorella* is not yet "in the bag," but the need for it as food in some parts of the world may be so great that one would expect persistent experimentation on its commercial production by government or industry or both. Something is being done in Japan by H. Tamiya and his assistants. Some, like A. T. McPherson, past president of our Academy, might prefer to put equivalent effort and funds into research on synthetic food production, uncomplicated by the vagaries of a sensitive living microorganism.

One cannot in limited space describe in detail the research that goes on in Bob's laboratories. Because his experimentation is quantitative, the equipment in his rooms in the south end of the third floor and in the attic of Patterson Hall reminds one of apparatus in a laboratory of physical chemistry. To be controlled are the duration, wave length, and intensity of light, the temperature, the nutrient medium, and the sterility of cultures. And arrangements must be made for quantitative sampling of the culture from time to time. Radioactive tracers are used in some experiments, with the necessary equipment. Bob does not regard his laboratories as engaged in research on photosynthesis, but he must be as



skilled in light control and measurement as if photobiology were his specialty. A room is being constructed now for the calibration of his light producing and measuring equipment. One corner of one room does look biological, for there he keeps stand-by cultures of green algae growing on agar slants. There were dozens of tubes here containing many species of algae.

How does one tell one species of *Chlorella* from another? They all look like tiny mottled green spheres, and the cell wall is without characteristic pattern. As among certain bacteria, a physiological classification is more useful than a morphological one. Bob now has a Japanese student, Miss Ikuko Shihira, who is working on the physiological classification of the species of this genus, which live in both fresh and salt water. I wondered whether the American Type Culture Collection here in Washington has a comprehensive collection of green algae. Bob says they have only a few; the best collection is at Indiana University.

*Chlorella* farming is not the only possible practical application of green algae. Some attention has been given to the use of algae to assist in the purification of the effluent from sewage treatment plants. And since bioastronautics became a subject for serious study, work is being done on the use of algae for adding oxygen to and removing carbon dioxide from space vehicles. Also, increasing attention is being paid to biological oceanography, in which the physiology and ecology of plankton, "the grass of the sea," are important. All these subjects are connected with Bob Krauss and his laboratories.

It was heartening to see him at the height of his powers, well supported financially both by granting agencies and his own university, attracting good students whom he will train in basic research, carrying his message outside his own campus not only through his publications but by invitational lectures, and finally acting like a good citizen of the Washington Academy of Sciences as adviser to serious high school students who want to use algae in their science fair projects. May he continue to have the courage and the wisdom to say no! whenever attempts are made, as they will be, to lure him away from his principal objective—to learn more about the physiology of algae!

—Frank L. Campbell

## SCIENCE AND DEVELOPMENT

The International Geophysical Year investigations have yielded tons of records of data on earth, sea, air, and space. More than 15 tons of records are now on hand from the Antarctic alone. Many years will be required for their study and digestion. According to the most recent annual report of the Smithsonian Institution, this vast accumulation of data results

from the work of between 20,000 and 30,000 scientists of 66 nations in "the greatest cooperative enterprise for peaceful purposes in all human history." A number of outstanding discoveries have been made. Many more doubtless will come in the future from the gradual assimilation of the data.

The National Bureau of Standards has established two new Technical Advisory Committees, one on Calibration and Measurement Services, and one on Engineering and Related Standards. The purpose of the committees is said to aid the Bureau in cooperating with industry in the fields of precision measurement, calibration, and standard practices. They include leaders in specialized fields drawn from industry. These committees are in addition to a group of technical advisory panels composed of representatives of leading professional scientific and engineering societies that advise various technical divisions of the Bureau.

The mechanism by which hydrogen atoms are removed from ethane during vacuum ultraviolet photolysis has been determined at the National Bureau of Standards. This finding is a product of the basic research program of the Physical Chemistry Division. By means of spectrographic analysis of deuterated samples, H. Okabe and J. R. McNesby (a member of the Washington Academy of Sciences) showed that two hydrogen atoms are usually split from a single carbon atom to form a hydrogen molecule. Ethylidene, which is produced simultaneously, reacts further to form higher hydrocarbons found in the products.

Georgetown University has received research and education grants amounting to \$222,860. The Very Reverend Edward B. Bunn, S. J., University president, announced on December 31 the award of \$162,060 by the Department of Health Education and Welfare for medical and dental research; \$50,800 by the National Science Foundation for support of a "Summer Institute in Mathematics for High School Teachers of Mathematics"; and a number of smaller grants.

A specialized digital computer for use as a research tool on the possibilities of an automatic weather station has been developed by the National Bureau of Standards in cooperation with the U. S. Weather Bureau. AMOS (Automatic Meteorological Observation Station) IV, the computer, receives and processes data from weather-sensing instruments and transmits the results via teletype to a central forecasting station and to airport weather stations. Automatic weather stations could be widely distributed, and would be especially useful in relatively inaccessible locations that are important sources of early data on meteorological activity.

**Food and Drug Administration has seized over 1,900 tons of soybeans for contamination with poisonous *Crotalaria* seeds in more than 30 Federal Court actions in Virginia and North Carolina.** *Crotalaria* is used as a soil-improving crop for sandy soil in the Southeastern States. Seed from volunteer *Crotalaria* plants growing in soybean fields become mixed with soybeans during harvest. Presence of *Crotalaria* seed in feed has been reported to cause mortalities in poultry flocks. Food and Drug scientists found that as little as three seeds per pound of feed causes retarded growth in rats. *Crotalaria* seeds are about one-third the size of soybeans and can be removed by sifting.

**A new National Meteorological Experiment Center has been established at Sterling, Virginia, by the Weather Bureau, U.S. Department of Commerce.** It occupies a 400-acre site, 25 miles west-northwest of Washington near the Dulles International Airport. The Center will conduct field tests to evaluate the accuracy, adaptability and reliability of experimental meteorological observational instruments. It will also be responsible for taking upper air and solar radiation observations for the Washington area. In addition, it will assist various Weather Bureau divisions in obtaining data in various fields of geophysical research and data for other government agencies.

**United States scientists now may easily have their unused publications transferred to Latin American libraries.** A new program for transfer has been organized by the Division of Science Development of the Pan American Union. Under this program, Latin American libraries are being urged to become members of the U.S. Book Exchange (USBE), a nonprofit corporation established in Washington in 1948, as a central office for exchange of duplicate copies of books and journals between libraries throughout the world. Membership includes about 1800 libraries, more than half of which are in foreign

countries. About 1,500,000 items are exchanged annually. Latin American libraries will request journals through regular USBE procedures. If certain items are not available in the USBE files, the Division of Science Development will announce such needs through appropriate professional journals. U.S. scientists may send their unused publications to the U.S. Book Exchange, 3335 V Street, N.E., Washington 18, D.C., or to the Division of Science Development, Pan American Union, Washington 6, D.C. The estimated value and mailing costs may be claimed as income tax deductions.

**A Symposium on Large Capacity Memory Techniques for Computing Systems is being sponsored by the Office of Naval Research.** It will be held in the Department of Interior Auditorium, Washington, on May 23-25. Attention will be focused on new ideas, research, and developments which may lead to novel computer memories with large capacities. Future advances in computer processing depend to a large extent on the development of new computing memories. Organizations engaged in appropriate research and development activities will be invited to contribute papers. Attendance is open to all interested technical workers.

**Biological Sciences Communication Project is the name of a large-scale study to identify and analyze all steps in the flow of biological information from source to user.** The study is being made by the American Institute of Biological Sciences under a grant from the National Science Foundation. It is under the direction of Charles W. Shilling. The study will include examination of methods of acquiring, indexing, storing, and retrieving printed scientific literature, needs of biologists for information, use of information, and characteristics of dissemination activities of existing agencies. Also, the effectiveness of visiting biologists' programs, conferences, and symposia will be considered.

## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington .....	LAWSON M. MCKENZIE
Anthropological Society of Washington .....	REGINA FLANNERY HERZFELD
Biological Society of Washington .....	HERBERT FRIEDMANN
Chemical Society of Washington .....	JOHN L. TORGESEN
Entomological Society of Washington .....	WILLIAM E. BICKLEY
National Geographic Society .....	ALEXANDER WETMORE
Geological Society of Washington .....	MARGARET D. FOSTER
Medical Society of the District of Columbia .....	FREDERICK O. COE
Columbia Historical Society .....	U. S. GRANT, III
Botanical Society of Washington .....	HAROLD T. COOK
Society of American Foresters .....	G. FLIPPO GRAVATT
Washington Society of Engineers .....	HOWARD S. RAPPLEYE
American Institute of Electrical Engineers .....	WILLIAM A. GEYGER
American Society of Mechanical Engineers .....	WILLIAM G. ALLEN
Helminthological Society of Washington .....	DOYS A. SHORB
Society of American Bacteriologists .....	MARY LOUISE ROBBINS
Institute of Radio Engineers .....	ROBERT D. HUNTOON
American Society of Civil Engineers .....	DOUGLAS E. PARSONS
Society for Experimental Biology and Medicine .....	KATHRYN KNOWLTON
American Society for Metals .....	JOHN A. BENNETT
International Association for Dental Research .....	GERHARD BRAUER
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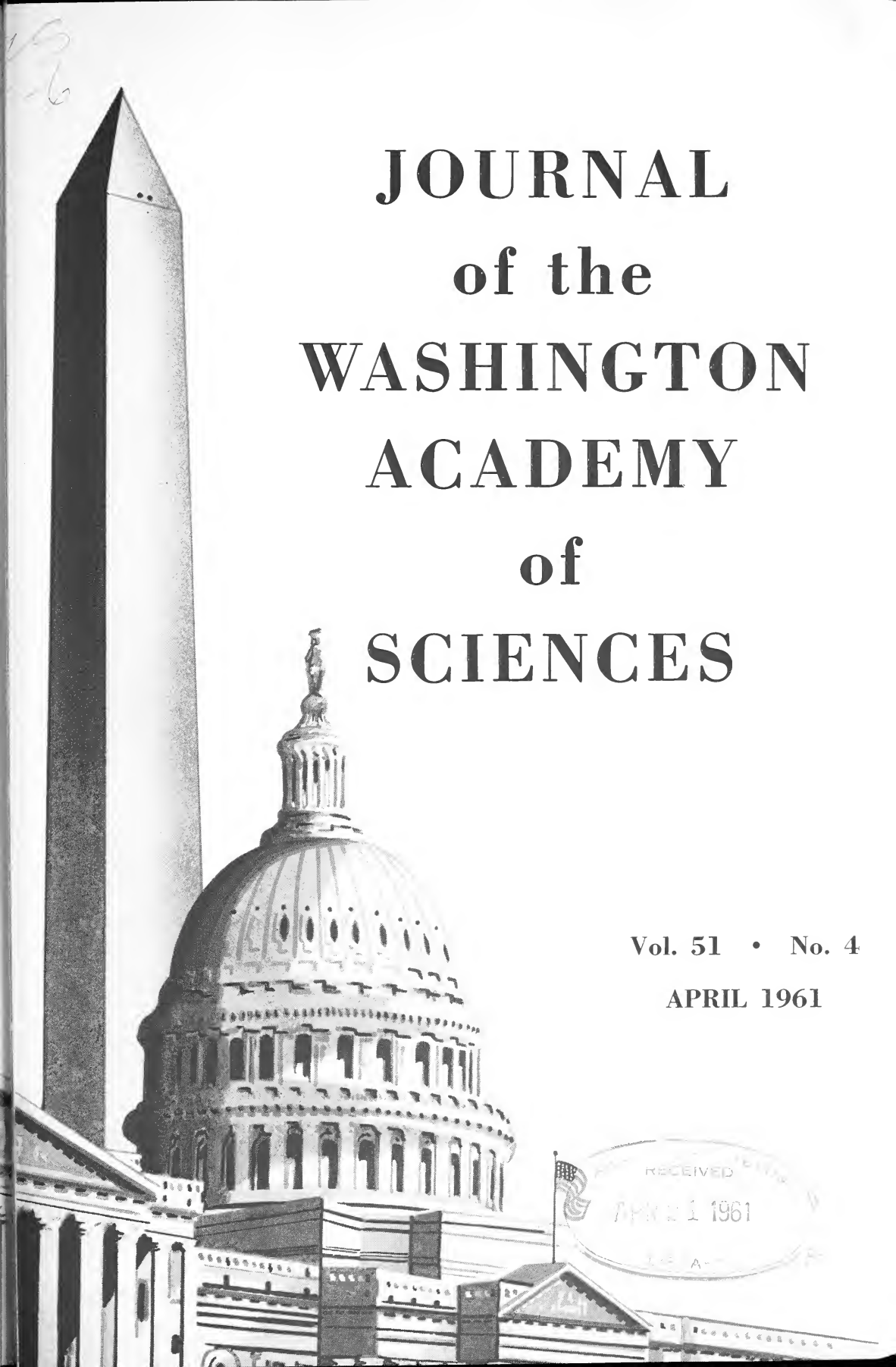
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A black and white illustration of the Washington Monument and the U.S. Capitol dome. The Washington Monument is a tall, slender obelisk on the left side of the image. The U.S. Capitol dome is a large, rounded structure with a statue on top, located in the center. The building's facade with columns is visible at the bottom.

# **JOURNAL of the WASHINGTON ACADEMY of SCIENCES**

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# JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

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WILLIAM J. BAILEY, University of Maryland

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# Geology and Geologists in Fiction\*

Mark W. Pangborn, Jr.

The geologist, on reading today's novels, dealing with business man, soldier, or artist, may wonder just what sort of literature has been written about his own profession. Let us take a quick look at 20 or so adult novels in English which most clearly feature geology or geologists, and see for ourselves just how our science fares. We will first consider escape literature, including science fiction, adventure novels, and detective stories.

The earliest appearance of geology in science fiction must surely be in Jules Verne's novel, *A Journey to the Center of the Earth*,<sup>1</sup> originally published in 1864 and reprinted in English many times. In it the narrator and his uncle, Professor Hardwigg, descend into the crater of Mount Sneffels, in Iceland, and, proceeding downward, discover that the earth's interior is hollow and inhabited by mammoths, plesiosaurs, and the like. This hollow earth theme has been used by other authors, notably Edgar Rice Burroughs, who built a whole series of lurid romances around Pellucidar and its grisly inhabitants. Of them the less said the better.

Conan Doyle's *The Lost World*,<sup>2</sup> however, is a most convincing novel about the survival of extinct species into modern times. In it the explorer-geologist George Edward Challenger leads a party to a great plateau hidden in the Brazilian back country; the top of this plateau is populated by dinosaurs and ape-men, among whom our adventurers have experiences which would overwhelm less stout hearts. As one might expect, the creator of Sherlock Holmes brings his characters vividly to life. One of them, the atrociously overbearing Professor Challenger, made such a hit with the public that Doyle made him the hero of several short stories. In one

of them, *When the World Screamed*,<sup>3</sup> Doyle definitely anticipates the Mohole by 45 years.

Another shining example of science fiction is *You Shall Know Them*,<sup>4</sup> by the French novelist Vercors, in which a scientific expedition discovers the man-ape, *Paranthropus erectus*, in the New Guinea jungle. No expedition, including the voyage of the Beagle, ever brought back more trouble. In a moment of weakness the expedition journalist is persuaded to take part in a great scientific experiment: by means of artificial insemination he finds himself mated to a female *Paranthropus*, and a father. Seized with remorse, the journalist murders his son and dares the police to do anything about it; the police do, and the remainder of the book deals with the ponderous efforts of British justice to determine whether or not the hybrid is *Homo sapiens*, living under the laws of God and man. We wonder why the author, working his hilarious vein, found it necessary to describe the party's geologist, Dr. Kreps, as resembling "a pachyderm, with a walrus moustache . . . with a voice, high and fluting as a young boy's."

In eight or ten rather unconvincing novels man and prehistoric beasts are brought face to face by means of gadgetry. In the best known of these tales, *Before the Dawn*,<sup>5</sup> by Caltech mathematician Eric Temple Bell, scientists build a "time reversal machine" and are rewarded by glimpses of gory battles between dinosaurs. A better example is L. Sprague De Camp's delightful short story, *Employment*,<sup>6</sup> in which paleontologist Gill Pratt discovers how to reconstitute prehistoric animals from their bones by electrochemical means; he begins by reconstituting *Castoroides*, a rather innocuous mammal of the late Pleistocene; you can imagine the security problems faced by his har-

\* Condensed from a talk given before the Geological Society of Washington, January 11, 1961.

assed staff as Pratt works back into the Mesozoic.

Another popular form of science fiction depicts the lives and times of early man. Most of this literature has been written for boys, who find this *genre* quite irresistible: a few titles, like Vardis Fisher's *Darkness and the Deep*,<sup>7</sup> may appeal to adults.

*A Journey in Other Worlds*,<sup>8</sup> written in 1894 by John Jacob Astor, is especially interesting, for in it we have the first fictional appearance of that now familiar figure, the government geologist called in to offer advice on major undertakings. In the year 2000, Professor Cortlandt, an "able man . . . with high forehead, greyish hair, and quick grey eyes" is the technical advisor to the Terrestrial Axis Straightening Corporation. This organization has discovered the powerful force "apergy," and hopes to use it to straighten the earth's axis from 23½ degrees to 0 degrees, thereby giving the earth a more uniform temperature. The Professor leads an expedition in an apergy-driven rocket to Jupiter and Saturn, which are still deep in the Mesozoic. Fortunately the book ends before the earth's axis is tampered with.

Those interested in the larger problems of geology may enjoy *The Frozen Year*,<sup>9</sup> by James Blish, which is concerned with the most publicity mad and poorly organized expedition ever to seek and get the sponsorship of the I.G.Y. Committee. If we do not approve of the management of this ill-starred expedition, I am sure that all of us will sympathize with its members as they sit, shivering, around a hole in the Polar ice, fishing tektites off the floor of the Arctic Ocean.

Geologists appear occasionally in the straight adventure novel. Among the very best is *Morgan's Mountain*,<sup>10</sup> by Arthur Mayse, in which a most attractive young geologist rescues a pilot and his daughter who have crashed in the wilds of British Columbia. In similar vein is Lawrence Earl's *The Frozen Jungle*,<sup>11</sup> in which

the last party to fly out of a Labrador mining camp is forced down and must spend a frightful winter in the wilderness; the geologist, an alcoholic because of war experiences, turns out to be the strongest character of the little group, and is purged of his neurosis as he leads the castaways to safety the following spring.

Volcanoes and earthquakes have been the villains of many adventure stories since the days of Bulwer-Lytton's *Last Days of Pompeii*. Most of these tales are pretty corny, but Dale Van Every's description of the New Madrid quake, in *The Trembling Earth*,<sup>12</sup> is as graphic an account of a natural phenomenon as has ever been written.

Most stories about caves are written for youngsters. The adult literature is not abundant, nor is it convincing, with the exception of Andrew Garve's *A Hole in the Ground*.<sup>13</sup> This is a thrilling story of spelunking in northern England, in which the villain is an unstable politician with Communist leanings, and the hero a charming and enterprising petroleum geologist who eventually makes off with the politician's wife.

There must be nearly a thousand adventure novels with a mining background. Most of these are "westerns" or "northern" in which the prospect is nothing more than a hook on which to hang a story, or are sociological tracts dealing with mine hazards or labor troubles. Less than a hundred have solid technical or historical backgrounds. The hero is almost invariably a clean, two-fisted, half-educated chap who foils the claim jumpers and wins the maiden's hand, but in *his* rare appearances the geologist's role is not always a happy one.

He first appears in 1886 in *John Bodewin's Testimony*,<sup>14</sup> Mary Hallock Foote's novel about contested mine ownership. The government geologist, Hilbury, is obviously modelled on Clarence King, and is flatteringly portrayed as a man "who might turn up almost anywhere . . . at the swell clubs in New York and Lon-



don . . . or at the President's reception, or digging his way up some mountain peak above snow line."

The hero of *Silver City Heyday*,<sup>15</sup> by William Kehaly, is the brilliant exploration geophysicist, Pierce Grant, whose technique and instrumentation are so advanced that he is able to block out a number of splendid ore bodies. Like all of us, Grant is frustrated by the income tax situation, but he takes the wrong turn and operates what is known as a moonlight mill. A nosy Treasury agent is accidentally killed, Grant takes it on the lam, and I am sorry to say that our gifted colleague is dropped by the sheriff's guns.

Surely the most unethical of fictional geologists is Bates Wallen, who sells his services to two rival outfits in Luke Short's excellent western, *Rimrock*.<sup>16</sup> The book's hero, a trusting paint salesman turned uranium prospector, can't understand why his big rival is picking up all the best claims, but eventually he catches on, and poor Bates has a rough time. Licensing might have prevented this mess.

There must be at least 300 adventure novels dealing with oil. Perhaps some 30 titles are soundly based in petroleum history or technology, and in eight or ten of them we see the form of the geologist. Usually he plays a minor role, for the hero, as in the mining novel, is almost invariably a half-educated youth who triumphs in the face of liquor, women, and skulduggery. But not always, for in William Heyliger's novel *Wildcat*,<sup>17</sup> in which the details of prospecting and drilling are beautifully drawn, the heroes are two resourceful young geophysicists who put all their savings on a flyer and strike oil.

Perhaps a score of detective stories feature earth science backgrounds, and in six or eight of them geologists play important parts. In Frances and Richard Lockridge's *Dead as a Dinosaur*,<sup>18</sup> a dedicated vertebrate paleontologist is murdered as impatient members of his family try to prevent him from squandering all his

money on the scientific expeditions of the Broadly Institute of Paleontology, "across the Park from the American Museum."

*Murder in Fiji*,<sup>19</sup> is one of two outstanding whodunits by news-analyst John W. Vandercook. In it the villain discovers gold-bearing andesite deposits, then is forced into several murders, hoping to prevent his secret from leaking; the Fiji government geologist breaks the case by correlating the murder localities with the andesite deposits as shown on his geological map. The other story, *Murder in New Guinea*,<sup>20</sup> features a maladjusted geologist with Communist leanings. This fellow discovers a fabulously rich uranium lode, and is then forced to do away with a succession of prospectors who blunder onto his secret: Vandercook's team of detectives get their man with the help of a Geiger counter, for he has become highly radioactive from packing samples of rich ore over the mountains.

The foregoing titles are essentially escape novels, which stress action and plot rather than the character of the scientist, who is only a device to move the plot along. The following four novels, however, are "serious," for in them the authors have attempted to give their geologists authentic personalities, and to fit them into a real world.

A rather charming historical novel is Caroline Dale Owen's *Seth Way*.<sup>21</sup> In it William Maclure discovers the unlettered boy Seth Way in a backwoods cabin, is impressed with his native abilities and thirst for knowledge, and gives him a scientific education. Seth develops into a competent conchologist and geologist, and becomes a leading light in the famed New Harmony community and a colleague of David Dale Owen and Thomas Say, on whom he is modelled.

In his novel *The Return*,<sup>22</sup> Herbert Mitgang draws an earnest if not completely convincing portrait of the geologist whose conscience won't let him be a good company man. Joseph Borken cannot accept,



in good grace, the presence of a prominent ex-Nazi in the New York office of the large mining firm where he works, so he gets himself transferred to Sicily, where he prospects for carnotite; while there he associates with some of the poorer Italians, and comes to share their hopes for land reform. His mere presence at a political rally threatens to compromise his value to the company, so Borken resigns in disgust and goes into business for himself. We might note here that the fictional geologist is notably restrained in matters of sex, if not positively frigid, but Mitgang's novel contains the only known geologists who really relax on Saturday night.

The hero of James Aldridge's excellent novel, *The Diplomat*,<sup>23</sup> also is troubled by his conscience. Micropaleontologist MacGregor, who has been brought up in Persia and speaks fluent Persian and Russian, is selected to serve as translator and advisor to a British diplomat, and accompanies him on a mission to Azerbaidjan in 1946 to see if the Russians are actually supporting the rebellion of that year. The politically-naïve MacGregor is disturbed by the fact that his diplomat boss is more interested in saving Persia's oil for the British Empire than in reporting the findings of the mission with scientific accuracy. Amidst a great scandal MacGregor denounces Britain's selfish role in Persia, and returns to his adopted country as a geologist.

Our profession gets perhaps its blackest eye from Honore Willsie, editor of the old *Delineator* magazine and purveyor of western romances to the rocking chair brigade. Her novel, *The Exile of the Lariat*,<sup>24</sup> is concerned with Hugh Stewart, a confirmed vertebrate paleontologist who lives what ought to be a very satisfactory life exhuming skeletons for museums. He faces a real problem, however, for throughout the book his wife, in-laws, and friends constantly badger him to get into a more "rewarding" profession, such as politics, where he can make use of his winning per-

sonality to benefit the citizens of his state! Eventually he is euchered into running for Governor of Wyoming, in order to prevent the hydro-power lobby from flooding his finest fossil bed. Stewart wins the election, but his experiences with the State welfare program convince him that his old profession is basically anti-social, and he becomes the biggest dam-builder and do-gooder in the State. If this contrived and discouraging novel proves anything, it is that the authoress, like a lot of her readers, prefers the practical man to the egghead.

It would be foolhardy to attempt to draw any composite portrait of the geologist from our small sampling. We would be on safe ground, however, if we admit that the image of the fictional geologist is not as good as we would like it to be. Yet, if we must rank his image below that of the civil engineer,<sup>25</sup> the doctor, or the artist in any professional popularity contest, he surely stands above, say, the fictional politician or the man in the grey flannel suit.

The nuclear scientist<sup>26</sup> has been the subject of several worth-while novels in recent years. We can hope that the geologist, too, will receive similar attention from thoughtful writers, whether scientist or professional novelist. Unhackneyed plots are abundant. For example, no novels have ever been based on the exciting lives that our pioneering geologists led in the Old West. No author has ever pitted an honest State geologist against the politics and disappointments that sometimes crop up in State capitals, nor has matched an enthusiastic field man against a neurotic wife who resents his long absences. The problems faced by the female geologist who invades what is essentially a man's profession must be worthy of a novel; can we ignore the perils that face her in the field?

If anyone doubts that a scientist should dabble in anything so subjective as literature, be assured that creative writing is now regarded with favor in high places: a government geologist who recently submitted a bit of science fiction to his superiors

had it returned with the comment that it was among his best work.

It seems likely that the rising interest in the personality and activities of the scientist will result in more and more stories about our profession. If it is too much to expect another *Arrowsmith*, with the geologist as protagonist, let us hope that at least some of these future novels will be meaningful to both the scientist and the public, and adequately reflect the thirst for knowledge, the critical outlook, and the self-dedication that sets the scientist apart from the average man.

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## Academy Honors Twenty-one Students

The March meeting of the Academy, held jointly with the Washington Junior Academy of Sciences, was the occasion for the presentation of Certificates of Merit to 21 high school seniors in this area. The group was cited for exceptionally meritorious achievement in the 1960 Westinghouse Talent Search.

At a dinner held at the Fairfax Hotel preceding this meeting, the students and

their teachers were guests of the Academy. Those present included the officers of the Academy and members especially interested in encouraging science talent. B. D. Evera of George Washington University, president-elect of the Academy, spoke briefly to the group on the importance of undergraduate education and the increasing need for broad preparation for scientific research.

At the general meeting held in the John Wesley Powell Auditorium of the Cosmos Club, President Philip H. Abelson presented the certificates to the students. A Symposium on Recent Significant Advances in Science followed, in which Christian B. Anfinsen, Jr., of the National Institutes of Health discussed biology after which Joseph Weber of the University of Maryland spoke on physics. Both speakers described major problem areas to which the students might expect to contribute upon completion of their collegiate training.

The students receiving the Certificates of Merit are as follows:

Thomas G. Andrews, Jr. (Bladensburg), Robert C. Bost, Jr. (Washington-Lee),

Marta A. Burns (Immaculata), John M. Cone, Jr. (F. C. Hammond), Leland G. Dobbs (Sidwell Friends), Michael J. Finegan (Fairfax), Dennis W. Herrin (Anacostia), Edward C. Jones (Wakefield), Steven L. Jordan (Montgomery Blair), Margaret E. Kottke (Bladensburg), David H. Malin (Walter Johnson), Rosalie A. McCanner (Woodrow Wilson), David C. Mendelson (Western), Margaret A. Nelson (Richard Montgomery), Michael C. Newlon (Western), Andrew R. Phelps (Sidwell Friends), Mary M. Shaw (Walter Johnson), Thomas M. Souders (McLean), Barry L. Sperling (McLean), Henry L. Vacher (Western), Robert L. Waymost (Bethesda-Chevy Chase).

### *A Staff Report—*

## **The California Academy of Sciences**

In large part, the California Academy of Sciences is to San Francisco and its tourists as the Smithsonian's Natural History Museum is to Washington and its tourists. The director of the California Academy, Robert C. Miller, who is also its curator of invertebrate zoology, is well acquainted with Past President Waldo L. Schmitt of the Washington Academy, who until he retired was head curator of biology in the U. S. National Museum and is a marine invertebrate zoologist.

Dr. Schmitt, Archibald T. McPherson, and other members of the Policy and Planning Committee, together with President Abelson, have been desirous of applying to the improvement of the Washington Academy whatever might be pertinent and useful in the organization and programs of the California Academy and of other academies of sciences. Accordingly, when Dr. Schmitt heard that Dr. Miller was coming to Washington on other business, he invited him to talk about the California Academy at the February 21 meeting of

the Board of Managers. Dr. Miller accepted the invitation and brought with him printed information about the California Academy, from which much of this staff report has been written.

The California Academy of Sciences is a large and successful civic enterprise, a fruitful association between scientists and the interested lay public. It is operated both for the advancement of science (chiefly natural history) through research and for the education of the public through exhibits, demonstrations, lectures in natural history, astronomy, etc. Its scientific work covers the world: its educational work the local population, resident and transient, and those elsewhere who are reached by its television program, "Science in Action."

The California Academy of Sciences was founded in 1853 when San Francisco was being fertilized by California gold. In those days, science and natural history were synonymous except in the older scientific centers of the world where natural

philosophy embraced all science. The Academy began with a "cabinet of specimens" and has never deviated from its original objectives, to collect specimens of plants, animals, minerals, etc., to study and describe them in scientific publications, and to exhibit the more interesting specimens to the public.

The Academy's building and collections were ruined by the earthquake and fire of 1906. Thus the Academy lost its downtown location and was permitted to rebuild on a much more attractive site in Golden Gate Park where its buildings are now situated. To North American Hall, completed in 1916, was added the Steinhart Aquarium in 1923, the Simson African Hall in 1931, the Hall of Science in 1951, the Alexander F. Morrison Planetarium in 1952, and the Alice Eastwood Hall of Botany and the Mailliard Library in 1959, all valued at more than \$5,000,000. In the United States, only the California Academy has a contiguous natural history museum, aquarium, and planetarium.

In fiscal year 1960, membership dues constituted only 3.65 percent of the total funds, \$611,000, provided for the year. About 36 percent came from grants and gifts, 33 percent came from the City of San Francisco, 23 percent was "profit" from various enterprises of the Academy, and the remainder, an amount greater than dues, was called "miscellaneous." But \$709,000 was expended during the year, making it necessary to solicit donations from business organizations, foundations, and others from whom \$59,000 was collected toward reduction of the operating deficit. These figures indicate that the California Academy was spending in 1960 about 60 times as much as the Washington Academy, exclusive of the Joint Board. Nevertheless, Dr. Miller is not satisfied with his Academy's financial condition. The Board of Trustees is trying to get a larger appropriation from the City of San Francisco, to increase the number of dues-paying members, and to obtain annual support from industry and foundations for

curatorial activities. Dr. Miller wrote, "The Academy's greatest need today is for a substantial endowment . . ." to support research.

There are 13 categories of membership, one to fit every purse. The total membership as of June 30, 1960 was 2,317, including 110 business and foundation donors. The record does not show what was paid by each category. Professional scientists are found among the 214 fellows of the Academy and to a lesser extent among the 1,274 regular members.

Until recently the Academy had a Board of Trustees composed of prominent, interested citizens and a Council composed of scientists. Now the Board and Council are combined into a single Board of Trustees of 27 members.

The Academy has a staff of professional curators in the following subjects: aquatic biology, astronomy, botany, entomology, geology, herpetology, ichthyology, invertebrate zoology, and ornithology and mammalogy. The curator of aquatic biology is also curator of the Steinhart Aquarium and program host for the TV series, "Science in Action." The curator of astronomy is also manager of the Morrison Planetarium. There is also a curator of exhibits. Nearly all curators have professional assistants. As of July 1, 1960, Joel F. Gustafson became associate director to relieve Dr. Miller of some of his administrative burdens.

The Department of Entomology is one of the largest in the Academy. It has some 2,500,000 mounted and labeled specimens and more than a million awaiting attention. The Academy received \$90,000 from the National Science Foundation to pay for arrangement and improvement of the collection over a three-year period: also a grant of \$18,000 to the curator for a three-year study of the order Embioptera. The curator of geology received a similar grant to study fossil diatoms in certain marine sediments and to train a graduate student in such investigations.

The work of the professional staff re-



sults in scientific papers that appear in appropriate journals or in the *Proceedings*, *Occasional Papers*, or *Memoirs* of the Academy. Their expeditions may yield popular articles, as the recent story of the African trip of Edward S. Ross for the collection of insects (Hunting Africa's Smallest Game, *National Geographic Magazine* 119, 406-419 (1961)). The Academy has an editor of scientific publications.

Turning to the activities of the Academy in public education, we find 2,600,000 people visiting the Academy in 1960 to see the exhibits, including the aquarium (free) and the planetarium (small charge for admission). The aquarium is maintained by appropriations from the City of San Francisco, which will pay for renovations now badly needed. Dr. Miller is proud of the fact that the planetarium star-projector, a very complicated optical device, was made in the instrument shop of the Academy at a time when it was impossible to obtain a Zeiss instrument. This shop became so proficient in optical work prior to World War II that it was able to accept contracts for the production of instruments for the Armed Forces.

From the information at hand it is not clear what meetings are held at the Academy. There is, we read, a public relations man on the staff who issues a monthly newsletter, which "describes current developments within the Academy, announces meeting schedules. . . ." etc. And in another place we read that "the Hall of Botany [now completed] will contain a commodious, well-appointed room for meetings of the Botany Club and other special gatherings . . ."

The Student Section of the Academy brought to it in 1960 "some 80 Bay area junior and senior high school students" who work after school and on Saturdays and holidays on their own projects under the direction of trained supervisors. The

Academy is also host to an annual Bay Area Science Fair. Last year 350 exhibits were shown to 88,000 visitors.

The Academy reaches the public outside of its own domain in various ways. The television program, previously mentioned, has a commercial sponsor, makes some money for the Academy, and reaches more than 600,000 people. It has received an extraordinary number of local and national awards, citations, and honors. An artistic, well-illustrated popular magazine called *Pacific Discovery* is published by the Academy six times a year. Subtitled a "Journal of Nature and Man in the Pacific World," it can now be obtained on many newsstands. The curators and their assistants answer many questions by correspondence and appear as guest speakers before many different organizations.

#### THE ANNUAL DINNER OF JANUARY 19

Because of history-making weather and traffic conditions on the night of January 19, only about a third of those registered for the Academy's annual dinner were able to attend. The deficit in the annual budget is too large to consider refunding all payments made in advance, and some members have definitely stated that they desire no refunds. The matter has therefore been placed on a voluntary basis. Non-attendants who have already paid may write the treasurer for partial or full refunds as they wish; and voluntary contributions of from one to four dollars will be gladly accepted from registrants who have not yet paid but wish to do so.

Communications may be sent to Norman F. Braaten, treasurer of WAS, in care of the Academy offices at 1530 P St., N.W.



# APRIL MEETING

(458th Meeting of the Washington Academy of Sciences)

## SPEAKER

*Francis J. Heyden, S.J., Director  
Georgetown University Observatory*

## SUBJECT

*Astronomy Looks to Its Future*

## DATE

*Thursday, April 20, 1961, 8:15 p.m.*

## PLACE

*John Wesley Powell Auditorium, Cosmos Club, 2170 Florida Ave., N.W.*



Francis J. Heyden, S.J., was born in Buffalo, N. Y. He received the A.B. degree from Woodstock College, and the M.A. and Ph.D. degrees in astronomy from Harvard University. Following early work as chief astronomer of the Manila Observatory and as a Harvard fellow, he came to Georgetown University in 1945, and has been director of the Georgetown Observatory since 1948. He has participated in a number of solar eclipse expeditions.

## 1961 BUDGET APPROVED

The following budget for 1961 was approved at the Board of Managers meeting on February 21. (The itemization also includes a \$50 increase that was approved at the Board meeting of March 7.)

Anticipated income for 1961 is \$12,070, including \$5,300 from dues. Any deficit will be met by withdrawals from reserve funds.

Journal .....	\$ 7,300 <sup>1</sup>
Secretary .....	1,500
Treasurer .....	170
Meetings Committee .....	1,200

Committee on Encouragement of Science Talent .....	250
Other committees .....	100
Directory reserve .....	1,000
Annual dinner and miscellaneous .....	400
AAAS (Academy conference) .....	20
Science Calendar .....	75
Joint Board on Science Education .....	500
Subtotal .....	\$12,515
Central office, through March 31 .....	1,425
Total .....	\$13,940

<sup>1</sup> Includes \$1,600 for 1960 bills paid in 1961.

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors have been assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, care of Agricultural Marketing Service, U. S. Department of Agriculture, Rm. 3917 South Bldg., Washington 25, D. C.*

## APPLIED PHYSICS LABORATORY

On January 18, **Ralph E. Gibson** addressed Naval Reserve Ordnance Company 5-9 on "The Applied Physics Laboratory—Its Program and Products."

Dr. Gibson was one of three participants in a recent R&D roundtable discussion sponsored by the American Society for Public Administration, the Society for the Advancement of Management, and the Armed Forces Management Association. His topic was, "The Role of Management in R&D Manpower Utilization."

**Albert M. Stone**, technical assistant to the director, participated in the Strategy for Peace Conference at Arden House, Harriman, N. Y., on January 12-14. On December 15 he spoke on "Plasma Dynamics Research" before Naval Ordnance Reserve Company 5-12.

**Alfred J. Zmuda** has been promoted to the principal staff of APL.

## COAST AND GEODETIC SURVEY

As part of a move involving several units of the Survey, **Norman F. Braaten** and **David G. Knapp** have relocated on the fifth floor of the Longfellow Building, Rhode Island Avenue at Connecticut. The move includes the Leveling Branch and the Geomagnetism Branch, including the IGY World Data Center A for Geomagnetism, Seismology, and Gravity.

**L. G. Simmons** and **Charles A. Whitten** attended a symposium February 6-8 on "Geodesy in the Space Age." Mr. Simmons presented a paper, "Highly Accurate Geodimeter Triangulation in the Cape Canaveral Area," and Mr. Whitten was a moderator for a Panel on Education

in Geodetic Sciences. The symposium was held at the Division of Geodetic Science of Ohio State University, Columbus.

**Donald A. Rice** attended a meeting of the Geophysics Panel, Scientific Advisory Board, USAF, held at Patrick AFB, Fla., on February 21-23.

## GEOLOGICAL SURVEY

**T. P. Thayer** returned in January from Europe, after attending the International Geological Congress and examining chromite deposits in the region between Yugoslavia and Pakistan. In Yugoslavia he spent two weeks in the field under the auspices of ICA and the Yugoslavia Geological Institute. Dr. Thayer also attended a symposium on chromite sponsored by the CENTO powers, which included visits to some of the principal chromite districts in Turkey, Iran, and Pakistan.

**Dorothy Carroll** is giving a course in pedology at American University during the spring semester.

## GEORGE WASHINGTON UNIVERSITY

**Mary Louise Robbins**, Department of Bacteriology, attended a symposium on the molecular basis of neoplasms at Anderson Memorial Hospital, Houston, Tex., in the week of February 20.

**B. D. VanEvera**, president-elect of the Academy, represented WAS President Abelson on the occasion of the recent Engineers and Scientists Day.

## HARRIS RESEARCH LABORATORIES

**Milton Harris** spoke before the Joint Meeting of the American Chemical Society and the American Institute of Chemists at the Hotel New Yorker on February 10. The title of his talk was, "Is the Chemist Ready for the Scientific Explosion?" Dr. Harris also gave talks on this subject before the Western Chapter of the American Institute of Chemists in Los Angeles on January 26, and before the Twin Cities Chapter in St. Paul on January 31.

Dr. Harris also spoke before the Piedmont (Ga.), Birmingham (Ala.) and New Orleans chapters of the American Institute of Chemists on March 7, 8 and 9, respectively. He discussed problems dealing with the chemist and his role in an expanding economy and the insecure world.

**Alfred E. Brown** has been appointed chairman of the new Science Committee of the Board of Trade. The Science Committee will establish and supervise the program of the recently-formed Metropolitan Washington Science Bureau.

Dr. Brown has been appointed a member of the American Association for the Advancement of Science Council Study Committee on Administration of Scientific Work. He also has been elected a member of the Executive Committee of the Science Manpower Commission.

**Edmund M. Buras, Jr.**, discussed "Soviet Artificial and Synthetic Fibers" at a dinner meeting of the Washington Section, American Association of Textile Chemists & Colorists, on March 17. Mr. Buras told what fibers are produced by the Soviet industry, how they compare with those used in the United States, and what new developments could be expected in both consumer items and high-performance textiles as a result of Soviet research efforts.

## NATIONAL BUREAU OF STANDARDS

Academy members presenting papers at recent meetings have included the following:

**Alexander, S. N.**: "NBS Experience with a Man-Machine Research Facility"—Office of Naval Research and University of Michigan jointly sponsoring a conference on "The Utilization of Research in Statistical Theory," University of Florida, Gainesville, February 1; **Bates, R. G.**: "Recent Developments in pH Measurements"—Instrument Society of America, Charleston (W. Va.) Section, January 9; **Broida, H. P.**: "Spectroscopy of Condensed Non-Polar Gases (Van der Waals Solids)"—University of Washington Physics Department, Seattle, January 10; **Eisenhart, C.**: "Precision and Accuracy—Experiment Design Aspects"—American Society for Quality Control, Metropolitan Section, South Orange, N. J., February 4; **Herzfeld, C. M.**: "Philosophies of Science"—All Souls Unitarian Church, Washington, February 7; **Kushner, L. H.**: "The Structure of Metals"—Joint Board on Science Education, Pomonkey (Md.) High School, January 25; and "Dislocation in Crystals"—Joint Board on Science Education, Anacostia (D.C.) High School, February 6; **Madorsky, S. L.**: "Impressions of a Recent Trip to Russia"—Naval Reserve Ordnance Company 5-10, Dahlgren, Va., January 16, and "Impressions of a Trip to Russia"—American University Park Citizens Association, Washington, February 6; **Paffenbarger, G. C.**: "Some Clinical Applications of Research Findings in Dental Materials"—American Academy of Restorative Dentistry, Chicago, February 5, "Recent Advances in the Field of Dental Materials"—Chicago Dental Society, February 5-8, and "Clinical Research and the Dentist"—Association of Dental Alumni of Columbia University, New York City, February 10; **Page, C. H.**: "Bridges, Trees, Polyhedra, and Electric Circuits"—Mathematics and Science Club, Wheaton (Md.) High School, January 9; **Posner, A. S.**: "The Crystal Chemistry of Dental Tissues"—Pathodontia Section of the First District Dental Society of New York, New York

City, January 9, and "The Biological Applications of X-Ray Diffraction"—Columbia University, College of Physicians and Surgeons, New York City, February 2; **Rhodes, Ida**: "Mechanical Translation"—University of Pennsylvania, Philadelphia, February 1; **Taylor, J. K.**: "Chemistry—Profession or Skill?" Akron Section, American Chemical Society, January 19; **Townsend, J. R.**: "Standardization in United States—Its History and Development"—Middle East Standardization Symposium, Cairo, Egypt, between January 30 and February 6; **Youden, W. J.**: "Elementary Statistical Design"—Society of Plastics Engineers, Washington, January 25, and "Systematic Errors in Physical Constants"—Advanced Seminars on Experimental Designs—held by the U. S. Army at the University of Wisconsin, Madison, January 10.

**S. N. Alexander** participated on a panel discussion of Computer Installations, Sampling Techniques, Input Equipment, Time Sharing, Programming, held by the Advisory Committee on Computers in Research of the National Institutes of Health on February 9.

## NATIONAL INSTITUTES OF HEALTH

**Wade H. Marshall**, chief of the Laboratory of Neurophysiology, NIMH-NINDB, has been made a foreign member of the Brazilian Academy of Sciences, in recognition of his valuable contribution to science and helpful collaboration with Brazilian research workers. Dr. Marshall spent some time in 1958 as a guest worker and in 1959 as a consultant at the Instituto de Biofisica, Universidade do Brazil.

## USDA, WASHINGTON

**Justus C. Ward** has been elected to chairmanship of the Interdepartmental Committee on Pest Control. He discussed pesticide problems before the California Extension Service Conference, Asilomar, Calif., on January 18.

**Ashley B. Gurney**, Entomology Research Division, spent the period February 9-19 in Puerto Rico, collecting insects in company with Aaron M. Nadler of New York City. Though the dry season is traditionally poor for collecting, many interesting species were secured in the Mariacuo Forest Reserve and in the vicinity of El Yunque. One order not previously known from Puerto Rico, the Zoraptera, was obtained.

**Edson J. Hambleton**, assistant to the director, In-charge Foreign Technical Programs, Plant Pest Control Division, ARS, attended the annual conference of personnel attached to the Regional Insect Control Project working in the Near East and Africa at Beirut, Lebanon, January 9-13. From January 16-21 he served as a U. S. delegate to the ninth session of the FAO Technical Advisory Committee on Desert Locust Control, Rome, Italy. Following the Rome meeting, Mr.

Hambleton visited the RICP post at Tripoli, Libya, before participating in the first African Pest Control Seminar held in Tunis, Tunisia, from January 25 to February 3. This Seminar was organized and conducted by personnel of the Regional Insect Control Project in cooperation with the International Cooperation Administration and the U. S. Operations Mission to Tunisia. Seven African countries participated. The purpose of the Seminar was to stimulate the development of more effective control organizations and better international cooperation in pest control. Papers presented concerned role of government and farmer in pest control, organization of pest control, quarantine services, insect survey, use of aircraft, and modern techniques. Panel discussions were held on locust control, pests of citrus, cotton, fruits and vegetables, and stored products.

## RETIREMENTS

The following Academy members retired in 1960: Allan M. Bateman, Edwin H. Behrend, Doris H. Blake, Curtis P. Clausen, E. A. Eckhardt, James Gilluly, Oliver H. Gish, Eleanor B. Knoff, Walter B. Lang, Atherton H. Mears, Harold Morrison, and L. W. Parr.

## DEATHS

**Arthur T. Pienkowsky** died December 31 in Chicago, where he had been living since 1953. He was 87 years old. He was graduated from the University of Chicago in 1898 and taught in Indiana and Illinois high schools from then until 1903. He was appointed laboratory assistant in the Bureau of Standards in 1904, and was a physicist when he retired in 1944. Following retirement, he served as consultant to the Torsion Balance Company.

## AFFILIATED SOCIETIES

*Where information as to the specific program scheduled for meetings of Affiliated Societies was not available sufficiently in advance to have been included in the Calendar of Events for the March issue of the Journal, it is carried below as a news item. Additional items considered of general interest are noted at appropriate points.*

### Acoustical Society of America, Washington Chapter

The March meeting date was shifted from the 3rd to the 2nd Monday, at which time the members heard Robert W. Young, U.S. Navy Electronics Laboratory, speak on "Piano Tunings and Intonation of Various Wind Instruments." This event took place in the Exhibit Room, Industrial Building, NBS.

The Society is currently engaged in polling its membership with a view to selecting the

most favorable meeting time and place. It is perhaps a commentary on the current Washington scene that they report "requests to meet in almost every building of adequate size in the Metropolitan Area and on all nights," with a desire for "plenty of parking."

### American Institute of Electrical Engineers, Washington Section

The Division of Instrumentation and Telemetry held its discussion on March 13, rather than March 6, as first announced, and added to the program a second paper on "Rocket Propulsion Measurements."

### American Society of Civil Engineers, National Capital Section

At a luncheon meeting on February 28, William E. Finley, National Capital Planning Commission, spoke on "Metro—2,000 A.D.," an estimate as to what our cities will be like in another several decades.

As a special feature of the annual dinner meeting, Ivan A. Nestigen, HEW, discussed programs of his Department, with particular attention to water pollution control, hospital and school construction, and atmospheric pollution.

A special committee of the Section has recommended the names of Waldo E. Smith and W. O. Hiltabidle, both past presidents, for consideration as nominees for national director, District 5. Members will ballot shortly.

A number of local sections of national engineering societies are working toward the development of a United Engineering Center, comparable in some ways to the new ACS building here in Washington, in support of which members of the various engineering groups are urged to contribute.

### American Society of Mechanical Engineers, Washington Section

The sixth annual Gas Turbine Conference and Products Exhibit, a joint effort of the Gas Turbine Power Division of ASME and the Department of Defense, was held at the Shoreham Hotel, March 5-9. A wide spectrum of technical papers and exhibits, covering recent progress in gas turbines for aircraft, automotive, and marine situations, was available.

### Botanical Society of Washington

On March 7, L. B. Smith spoke to the Society on the research and service activities of the Department of Botany of the Smithsonian. A tour of the laboratories of the Division of Radiation and Organisms was arranged by William Klein.

### Chemical Society of Washington

At a Board of Managers meeting on February 23, an *ad hoc* Committee on Topical Groups was



established to implement the formation of topical groups within the Society. The Special Committee on Employment outlined its plans to establish a file of persons seeking employment, and of employers having jobs to be filled. The Board endorsed a proposed code of professional conduct, scheduled for consideration on March 26 by the national Council of the American Chemical Society.

At the Society's annual Hillebrand Award Dinner on March 9, Frank T. McClure of the Applied Physics Laboratory received the Hillebrand Prize for 1960 for his contributions to a knowledge of solid propellant combustion. Dr. McClure then addressed the Society on the subject, "Rockets, Resonance, and Physical Chemistry."

#### **Entomological Society of Washington**

Our contact reports that Reece I. Sailer is now established in the European Parasite Laboratory, Seine, France, where he is investigating insects that may be introduced into the United States as agents of biological control. Ashley B. Gurney visited Puerto Rico during February and reported on his collecting activities at the March meeting of the Society.

#### **Geological Society of Washington**

M. F. Kane spoke on "Relationship between Isostasy and Geologic Structure in Clark County, Nevada," Augusto Gansser on "Salt-domes and Mud-volcanoes," and D. M. Pinckney on "Veins and Hydrothermal Alteration in the Boulder Batholith, Montana" at the March 8 meeting. Two weeks later, D. B. Krinsley, USGS, dealt with "Limnological Investigations at Centrum Lake, N.E. Greenland," Roland Brinkman, of the University of Bonn, with "Deformation of Fossils and Rocks," and Edwin Roedder, USGS, with "Depression of the Freezing Point in Fluid Inclusions."

#### **Helminthological Society of Washington**

A varied program was available to the Society at its March 15 meeting at NIH, in Bethesda, including papers on the parasitic nematode *Nippostrongylus* and on helminthology in Australia (R. I. Sommerville, Sydney), on *Trichinella* (L. J. Olivier, NIH), on *Trypanosoma* (W. F. Cantrell, NIH), on cultivation of *Entamoeba* (L. S. Diamond, NIH), and on schistosomiasis in India.

#### **Insecticide Society of Washington**

"The Foreign Quarantine Entomology Program of the Public Health Service," by John H. Hughes, PHS, and "New Problems in Disinsection of Modern Aircraft," by R. A. Fulton, USDA, constituted the March 15 program of the Society.

We are informed that Martin Jacobson, USDA,

has been given a \$300 award for his outstanding work on the gypsy moth sex lure, and that Sam Gertler has retired from the Pesticide Chemicals Research Branch, USDA, after 36 years of service, receiving a letter of commendation from Secretary Benson. William E. Bickley, University of Maryland, has been elected president of the American Mosquito Control Association.

#### **Institute of Radio Engineers, Washington Section**

One of the more comprehensive and informative bulletins distributed by societies affiliated with the Washington Academy is that of the IRE. Much of its March issue honors four new Section Fellows: Robert J. Adams, Richard F. J. Filipowsky, Delmer C. Ports, and Gustave Shapiro.

The Section boasts an impressive array of no less than 17 professional group chapters, some of which from time to time sponsor the regular sectional meetings or hold sessions of their own. In March alone, there were four such events: on March 8, the group on Component Parts heard a discussion of "Solid State Ceramic Devices"; on March 14, the group on Microwave Theory and Technics dealt with "Microwave Components for the 1.5-3 Millimeter Wave Region"; on March 16, the group on Bio-Medical Electronics considered "Automatic Monitoring of Airborne Biological Products"; and on March 23, the group on Antennas and propagation took up "Television Transmitting Antennas."

The Second National Symposium on Human Factors in Electronics, noted in the March *Journal*, plans to treat man-computer relationships, human factors in air traffic systems, in ship navigation and communication, and information and communication in electronic system maintenance.

An editorial on the final page of the Section bulletin reports concern on the part of engineers as a group, voiced by A. H. Flax of Brooklyn Polytech, that loose usage of the terms "scientist" and "engineer" has been responsible for a loss of stature by the latter in the public mind, and a decline in engineering college enrollments.

L. V. Berkner, national president of IRE, was the principal speaker at the annual dinner meeting of the Washington Chapter on February 11. He spoke on "Meeting the Challenge of the Space Age—Professional Development through the Institute of Radio Engineers."

#### **Medical Society of the District of Columbia**

If we may judge by the bulletin "Current Medical Events," scarcely a day goes by without some event of interest to the medical personnel of the city—26 are noted for March, as many as five on a single day.



**Society for Experimental Biology and Medicine, District of Columbia Section**

No meetings of the Section are to be held in April or May; the annual dinner is currently scheduled for June 1.

**CALENDAR OF EVENTS**

*Events which will take place, so far as we can determine at the time of writing, subsequent to the appearance of the Journal are noted below. Where possible, the nature of the program is indicated; in many instances the entry merely notes date and place of a regularly scheduled meeting of the organization named. Last minute changes in time and place, or emergency cancellations, may in certain instances alter the situation.*

**April 4—Botanical Society of Washington**

The Society plans a special, early-evening trip to the National Arboretum in place of its regular formal sessions. Detailed schedule will be sent to members prior to that time.

**April 5—Washington Society of Engineers**

John Wesley Powell Auditorium, 8:00 p.m.

**April 6—Entomological Society of Washington**

Room 43, U. S. National Museum.

**April 10—American Society for Metals, Washington Chapter**

Silver Certificate Night; nine members, including five members of the Washington Academy of Sciences, will be honored for 25 years' membership in the Society. P. C. Rossin, Universal-Cyclops Steel Co., speaks on "Infab Inert Atmosphere Fabrication Facility."

AAUW building, 2401 Virginia Avenue, N.W., 8:00 p.m.

**April 10—Institute of Radio Engineers, Washington Section**

Regular section meeting, sponsored by the Professional Group on Electron Devices.

**April 11—American Institute of Electrical Engineers, Washington Section**

PEPCO Auditorium, 8:00 p.m.

**April 11—American Society of Civil Engineers, National Capital Section**

John Wesley Powell Auditorium, 8:00 p.m.

**April 11—Institute of Radio Engineers, Washington Section**

Meeting of Professional Group on Microwave Theory and Technics.

**April 12—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

**April 13—American Society of Mechanical Engineers, Washington Section**

Meeting in area of Division of Applied Mechanics.

PEPCO Auditorium, 8:00 p.m.

**April 13—Chemical Society of Washington**

Linus Pauling will speak on "The Structure of Electron Deficient Substances."

John Wesley Powell Auditorium, 8:15 p.m.

**April 14—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

**April 17—Acoustical Society of America, Washington D.C. Chapter**

**April 17—Society of American Military Engineers, Washington Post**

YWCA, 17th and K N.W., 12:00 noon.

**April 18—Anthropological Society of Washington**

William Caudill, NIH, will speak on "Anthropology and Psychoanalysis: Some Theoretical Issues."

Room 43, U.S. National Museum, 8:15 p.m.

**April 18—Institute of Radio Engineers, Washington Section**

Meeting of Professional Group on Antennas and Propagation for its regular lecture.

**April 19—Insecticide Society of Washington**

Symons Hall, University of Maryland, 8:00 p.m.

**April 19—Washington Society of Engineers**

John Wesley Powell Auditorium, 8:00 p.m.

**APRIL 20—WASHINGTON ACADEMY OF SCIENCES**

**April 25—American Society of Civil Engineers, National Capital Section**

Luncheon meeting at YWCA, 12:00 noon.

**April 25—Society of American Bacteriologists, Washington Branch**

Sternberg Auditorium, Walter Reed Army Medical Center, 8:00 p.m.

**April 26—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

**April 27—American Society of Mechanical Engineers, Washington Section**

Meeting in division of metals engineering. L. M. Kushner will speak on "Imperfections and Mechanical Properties," and H. E. Frankel on "Down to Earth Space Problems."

PEPCO Auditorium, 8:00 p.m.

**April 28—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

## THE BROWNSTONE TOWER



Progress in science takes place primarily in the minds of individuals. To stimulate fruitful solitary thinking, communication of various kinds among scientists is necessary. Since World War II I have been engaged in assisting scientists to communicate among themselves. As ex-

ecutive secretary of the Division of Biology and Agriculture, National Academy of Sciences—National Research Council, I am concerned principally with communications in the field of scientific strategy, or policy, usually through meetings of committees, conferences, or symposia.

You will be interested, I think, in the recent annual meeting of the members of the National Research Council, on March 9-11. It is an example of an unusually stimulating interdisciplinary conference in Washington. Limited in attendance and not covered by the press, this annual meeting is not as well known to the local scientific community as is the annual spring meeting of the National Academy of Sciences.

The National Research Council, as the name implies, is in part a council of more than 275 members who represent the national scientific societies of the United States or the scientific organizations within the Federal Government's departments. Some, called members at large, have no liaison responsibilities, and all, as experienced scientists, are expected to speak their own minds on questions of policy. The National Research Council is also the operating arm of the National Academy of Sciences, and as such enlists the services of thousands of scientists and technologists who serve without financial compensation on NAS-NRC committees. The members (council) of the National Research Council have the opportunity, particularly at annual meetings, to influence the scope and character of the committee activities of NAS-NRC.

Prior to 1958 the members of the National Research Council had never met in plenary session; instead, each of the eight substantive divisions of the Council held its own annual meeting, which was attended by the members affiliated with it. It seemed that there might be a better way to exchange ideas among the officers, members, and staff of the Council, and in 1958 the members met for the first time as a single

body in a three-day conference, within which an afternoon and evening were devoted to simultaneous, separate meetings and dinners of the eight divisions. This plan worked so well that it became the pattern, with slight modifications, for the subsequent annual meetings.

With the above background in mind you will be able, I hope, to understand the nature of the recent conference. It was attended by about 200 members of the National Research Council from all parts of the United States. The density of geographical distribution of members is not uniform, but is inversely related to distance from Washington, probably for reasons of economy and convenience of access to NAS-NRC. Many representatives of societies live in the Washington area, and nearly all the Government liaison members live here. Consequently a number of members of the Washington Academy are also members of the National Research Council; for example, Past President A. T. McPherson represents the National Bureau of Standards, and Past President Waldo L. Schmitt represents the Society of Systematic Zoology. Associate Editor Russell B. Stevens represents the American Phytopathological Society, and Robert W. Krauss, the subject of my previous Brownstone Tower, represents the American Society of Plant Physiologists. A few of the members of the National Research Council are also members of the National Academy of Sciences, and Detlev W. Bronk, president of the Rockefeller Institute, is the head of both the Council and the Academy.

The recent Annual Meeting of the National Research Council opened at noon on March 9 with a luncheon served by a caterer on rows of tables covering the floor of the Great Hall, or rotunda, of the Academy building on Constitution Ave. Because a member of the National Research Council serves at least three years, and often by reappointment for longer periods, I saw many familiar faces at the tables and began then the pleasant duty of meeting all of the 47 members of my division who were present, including five new members.

After lunch all the members gathered in the Lecture Room to hear the opening address by President Bronk, who never fails to hold his audience in admiring attention. Then followed two illustrated talks on instrumentation and scientific significance of meteorological satellites: the first by William C. Stroud of NASA, and the second by Harry Wexler of the Weather Bureau. The latter is a member of the Washington Academy and a recent recipient of one of the National Civil Service League's Annual Career Civil Service Awards.

The purpose of this and other reports at the plenary sessions was to acquaint the mem-

bers of the Council with the current status of complex scientific and engineering projects that are in some way of interest to everyone. Thus the members are lifted out of their usual sphere of interests and are given a new and exciting perspective.

After a reception and buffet dinner in the Great Hall, the members returned to the Lecture Room and heard J. B. Wiesner, Assistant to the President for Science and Technology, talk about his responsibilities as an adviser to President Kennedy and as chairman of the President's Science Advisory Committee. The evening ended with an illustrated talk by Harry Hess on the Mohole, with an up-to-the-minute report of success in the first attempt to drill into the bottom of the deep ocean. This of course is preliminary to a later attempt to drill through the crust of the earth to the mantle.

On the morning of March 10 each member was free to attend one of three simultaneous meetings in accordance with his preference. The titles were (1) The Role of Mathematics in Other Sciences, (2) What Should the Public Understand about Science? and (3) Problems Created by the Rapid Growth of Science. Distinguished scientists were selected as chairmen of these meetings (J. B. Rosser, Paul Weiss, and Saunders MacLane, respectively) and interested, articulate persons were asked in advance to prime the discussions. Thus all members were encouraged to express themselves on one or another of these topics.

In the afternoon eight separate division meetings were held. It was my duty to attend the one in Biology and Agriculture, in which, for the first time, a small symposium was featured, on the undesirable side effects of pest control in agriculture, forestry, public health, and wildlife management. The intention of the International Union of Biological Sciences to develop an International Biological Program also was discussed. It is to be a planned program requiring international collaboration over a period of years on biological projects that cannot be efficiently advanced in any other way.

In the evening our trend toward scientific integration was continued by the holding of a joint dinner of the Divisions of Biology and Agriculture and Chemistry and Chemical Technology. Dr. Bronk attended our dinner. The after-dinner speaker was Farrington Daniels, vice president of the National Academy of Sciences, who talked on his experiences in India, Southeast Asia, and South America on missions of good will for the Academy. How, he asked himself, can native science and technology be developed in these countries so as to make possible a standard of living for their peoples approaching that which we now enjoy? Again

our members were stimulated to think about science as a world-wide activity requiring international cooperation.

On Saturday morning, March 11, the members assembled in the Lecture Room to hear the chairman of each of the eight divisions talk briefly about the principal activities and plans of his division; also to hear the chairman of each of the Friday morning sessions characterize the discussion at his meeting. At one point during the morning, Alan T. Waterman, director of the National Science Foundation, talked on the relationships between NAS-NRC and NSF. Dr. Bronk opened the Saturday morning session and presided throughout, giving the audience interesting information and comment on the subjects being discussed. The meeting was remarkable for its great diversity, its important ideas, its good humor, and its brilliance. I wish all members of the Washington Academy could have enjoyed it and profited by it.

—Frank L. Campbell

## ACADEMY ACTIVITIES

### FEBRUARY BOARD MEETING

The Board of Managers held its 535th meeting on February 21 at the National Academy of Sciences, with President Abelson presiding.

The minutes of the 534th meeting were approved. Dr. Specht indicated that Dr. Seeger's report of the Committee on Science Education, presented at that meeting, had been inadvertently omitted but would be added to the permanent minutes.

Committee appointments for 1961 were announced. (See *March Journal*, pages 34-35.)

For the Policy and Planning Committee, Dr. Campbell presented a report containing the following recommendations, which were adopted by the Board after considerable discussion:

(1) An effort should be made to build up membership in the Academy before it is recommended that dues be increased. The definition of "scientific attainment" should be broadened to include the attainment of leadership in the societies affiliated with the Academy, as evidenced by election to office, particularly to the presidency of such societies.

(2) It should be suggested to affiliated societies that they be represented on the Board of Managers by their president, president-elect, or past president.

(3) Before it is recommended that dues be increased, the *Journal* of the Academy should be improved. To give the *Journal* greater support under a balanced budget, the cost of central office services should be reduced or eliminated. Specifically, the Academy's full-time employee



should be released as of March 31, and a volunteer executive secretary should be appointed, to serve if possible without paid assistance.

(4) The Board of Managers should meet on the first Tuesday of each month in which the Academy meets, instead of on the third Tuesday.

The budget for 1961 was adopted in the amount of \$13,890, this figure including \$1,425 for operation of the central office through March 31. (See details elsewhere in this issue.)

Dr. Frenkiel discussed plans of the Meetings Committee for the coming year. He indicated that it was hoped to emphasize presentations with general society interests, and to consider controversial subjects and such interdisciplinary discussions as would arise over overlapping areas of interest in science. The use of discussion panels will be explored. Further, special meetings may be held in addition to the regularly scheduled meetings.

Dr. Abelson, speaking for Dr. Robbins of the Membership Committee, reported on plans to increase the membership during the current year by as many as three to four hundred individuals, to offset the disadvantages under which the Academy is now operating.

The Secretary presented for First Reading the names of 18 candidates for membership.

The Board approved the awarding of certificates of merit, at the Academy meeting of March 16, to 21 high school students of the Metropolitan Area, for their achievements as winners or runners-up in the 1960 National Science Talent Search (see March issue, page 36).

Following the second reading of their names, the following persons were elected to membership in the Academy: Calvin Columbic, Reino W. Hakala, Ralph Klein, Herbert L. Ley, Jr., Joseph B. Morris, Austin C. Polins, Preston T. Talbert, George C. Turrell, and Elizabeth G. Frame.

Reporting on the *Journal* Mr. Detwiler announced that Lawrence A. Wood had agreed to serve as one of the associate editors. The Board approved the appointment.

Speaking for himself and the treasurer, Dr. Specht indicated that in future, requests for resignation by members in good standing would be acted upon without referral to the Board.

Dr. Abelson then presented the guest of the evening, Robert C. Miller, director of the California Academy of Sciences, who informally discussed the history, organization, and activities of this group.

## MARCH BOARD MEETING

The Board of Managers held its 536th meeting on March 7 at the National Academy of Sciences, with President Abelson presiding. The minutes

of the 535th meeting were approved with corrections.

On recommendation of the Executive Committee, the budget of the Committee on Encouragement of Science Talent was increased by \$50, to a total of \$250.

Dr. Frenkiel discussed the forthcoming general meeting on March 16, at which members of the Junior Academy would be honored; he indicated that following the formal lectures by the speakers of the evening, various physicists and biologists would be asked to join in an informal discussion.

For the Membership Committee, Dr. Robbins presented for first reading the names of three candidates for membership.

Dr. Robbins indicated that steps were being taken to establish a new Membership Committee Panel on Engineers; also, that the Mathematics Panel would be expected to process nominations of teachers through the recommendation of Keith Johnson, who will be made an additional member of the Panel. A discussion of proposed changes in the membership nomination form was carried over to the next Board meeting.

At the request of Dr. McPherson of the Committee on Grants-in-Aid, the Board approved an award of \$109 to Michael Souders for a research project.

The Board approved a recommendation by Dr. Campbell of the Policy and Planning Committee, to the effect that the retiring president of the Academy should be a member of the Board in the year following his presidency. The matter will be brought to the membership for approval at election time.

Dr. Brenner described plans of the Committee on Encouragement of Science Talent for the dinner and certificate presentations at the March 16 meeting, and asked for volunteers to help sponsor the dinner.

Dr. Taylor presented a report on operations of the Joint Board on Science Education, arising out of the current grant from the National Science Foundation. Dr. Taylor was complimented on his achievements with the grant program; he responded by pointing out that much of the success of this program was due to the active cooperation of WAS members who gave much time and thought to the prosecution of the work.

Dr. Taylor announced that at the instigation of Raymond Seeger, a committee of women in science had been set in motion to stimulate the adoption of science careers by girls, and to advocate the teaching of science in girls' schools. Chairman of the committee is Katherine Way, who welcomes any further volunteer assistance.

Following the second reading of their names,

the following persons were elected to membership in the Academy: Louis S. Baron, Edward Hacksaylo, Thomas J. Henneberry, James L. Hilton, Miss Etsuko Osawa, Robert O. Belsheim, John P. Craven, Robert M. Rivello, Raul Rodriguez, Cecil T. Wint, James W. Butler, Theodore A. Litovitz, Paul E. Ritt, Carl F. Romney, William J. Thaler, Marvin Zelen, Pauline Diamond, and Mrs. Tempie R. Franklin.

The treasurer asked that all officers and committee chairmen authorized to obligate budgeted funds should have bills sent to themselves, approve them if proper, and forward to him for more prompt handling and payment.

## SCIENCE AND DEVELOPMENT

**A new building at Catholic University to house the Department of Biology is expected to be ready for occupancy before the end of the academic year.** It is a four-story building with a greenhouse and related facilities on the roof. There will be extensive animal house facilities and specially equipped laboratories for animal physiology on the top floor. Laboratories for plant physiology and bacteriology will be located on the first floor. There will also be a herbarium, teaching laboratories, media and transfer rooms, a large lecture room, library, and office-laboratories for staff members.

**This Nation's first measurement science center opened at George Washington University the week of February 2.** The program was organized by the school of engineering in cooperation with the National Bureau of Standards and assistance of the Martin Company of Baltimore. The Center will provide a curriculum in measurement science. About one third of the enrollees are graduate students from government and industry. The remainder are undergraduates in engineering. Eight courses in metrology will be offered which can be credited toward the requirements for an engineering certificate or degrees of bachelor, master, or doctor of science.

**A summary of United States earthquakes in 1958 has been published by the Coast and Geodetic Survey.** It describes earthquake activity in the United States and dependencies in 1958, and summarizes the earthquake locations obtained by processing reports from many foreign and domestic seismograph stations. This information is useful in mapping seismic areas and promoting public safety through better understanding of earthquake phenomena. The publication includes a list of Coast and Geodetic Survey and cooperating teleseismic stations.

**A Center for Research in Child Development is to be established at the National**

**Institutes of Health.** It was authorized by the Public Health Service Surgeon General in a memorandum dated February 17. The new Center will be responsible for a program to encourage and stimulate development and exploratory research in basic biological, behavioral, and clinical sciences related to the phenomena and health problems of childhood and adolescence.

**Larc, the fastest and most powerful ultra-high-speed calculator available to the Department of Defense, has successfully completed acceptance tests at the Applied Mathematics Laboratory of the U. S. Navy David Taylor Model Basin.** It is capable of storing 3 million 12 digit numbers or 3 million computer words on high-speed magnetic drums, and 30,000 words or numbers in ultra-high-speed core storage. It can perform 250,000 multiplications, additions, subtractions, or comparisons per second.

**A portable reflectance spectrophotometer, the first of its kind, to measure surface reflectance of soils and vegetation in natural environment is being tested by the U. S. Army Engineer Research and Development Laboratories, Fort Belvoir, Va.** Reflectance data obtained by this instrument has many applications to engineering, mineral, and water surveys as well as military problems. This instrument makes it possible to examine soil and vegetation in an undisturbed state. Previously samples had to be taken to the laboratory for measurements. The reflectance properties of undisturbed and disturbed samples are often markedly different. Reflectance data obtained in the field with this instrument have provided accurate information on which to base selection of film filter combinations with optimum characteristics for registering a desired tone contrast between objects in photographs.

**Measurement of natural gamma ray radiation of raw (grease) wool is a promising new method for predicting wool shrinkage.** The gamma rays are emitted by a natural isotope, potassium-40, that occurs mostly in the suint (dried sweat) of raw wool. Research by USDA scientists R. Kulwich, L. Feinstein, R. W. Decker, and C. Columbic of AMS and Mary E. Hourihan and C. E. Terrill of ARS has shown that this radiation can be measured with a newly-developed, highly sensitive low-level gamma ray detector. The measurement would indicate the amount of impurities (grease, suint, and dirt) which are removed in scouring and account for most of the shrinkage. The present method of predicting the yield of clean wool involves scouring and weighing small samples. The new method would be faster since no special preparation of the wool would be



necessary. The wool sample would merely be placed in a fiber drum for analysis.

**Development of a new electrostatic device to speed measurement of the fineness of wool-fibre sections has been announced by the U. S. Department of Agriculture.** The device was developed under a contract by H. G. Neil of the Special Instruments Laboratory, Knoxville, Tenn., in collaboration with wool fiber technologist Mary E. Hourihan of the Department's Beltsville Research Center. The new instrument arranges the fibers in parallel so they can be measured more easily and faster than by present methods. The aligned fiber sections, mounted in oil, are measured indirectly under a microprojector that produces an image larger than the actual fibers of a standard magnification. The images cast by the projector are measured quickly with a wedge scale. Having the fibers aligned makes it possible to measure the fibers more accurately and with a minimum turning of the wedge scale.

**The severe snowy winter that the Washington area has recently experienced was anticipated by Weather Bureau scientists early in December.** They noted that wind patterns around the Northern Hemisphere were reshaping themselves and predicted that they would bring the two necessary ingredients for a cold and snowy winter if they persisted. The first ingredient was a supply of cold air from Canada. The second was a flow of warmer moist air from the Gulf of Mexico and the Pacific Ocean. The first of these conditions by itself would result in cold dry weather. The second by itself would cause warm, cloudy, rainy weather. The two together in proper combination would cause cold snowy weather. That is what has happened in the Washington and Northeast areas since early December.

**Filterable viruses, invisibly minute semi-organisms which cause some of the most devastating epidemics, usually are latent in human tissues, apparently causing no harm.** They may remain thus for years, then suddenly turn vicious. This is stressed in a report on current concepts and advances in virus research published in the latest annual report of the Smithsonian Institution.

The viruses suddenly can mutate to form new strains and cause different disease symptoms. They may have quite different effects depending on the age, genetics, state of nutrition, and balance of the hormones of the host. "Conversion of a virus from a latent to an active state," says the report, "may be effected by seasonal factors. For instance, there is a tendency for polio to occur

in the summertime, or for sun and wind, somehow related to the seasons, to influence the emergence of herpetic lesions. There are also hormonal factors, such as those associated with pregnancy, that influence whether or not polio will result in paralysis."

**"X-ray Protection up to Three Million Volts," National Bureau of Standards Handbook 76, was issued in February** and is available from the Superintendent of Documents at 25 cents. This 52-page pamphlet sets forth standards of safety established by Subcommittee 3 of the National Committee on Radiation Protection and Measurement. It contains data and recommendations pertaining to all persons involved, including the manufacturers of the apparatus, designers and builders of the rooms housing it, the individuals in charge of installations, and the persons actually using the equipment. The Committee's basic philosophy on X-ray protection, according to a statement in the preface, is the same as expressed 30 years ago, namely, that unnecessary radiation exposure should always be avoided and all exposure held to the minimum compatible with practical clinical requirements.

**A record-breaking total of 75,000 new chemical compounds was reported by the world's chemists in 1960. About a fourth of the new chemicals—19,000—were made by American scientists;** Iron Curtain chemists reported approximately 9,000 new chemicals, while the Japanese accounted for almost 7,000 compounds. Other top chemical-producing countries include England and Germany.

The first cumulative index of *Index Chemicus*, published by the Institute for Scientific Information, Philadelphia, marks the first time that this information has been reported so promptly. The index was prepared by electronic computing equipment in record-breaking time—a historic achievement in chemical documentation. Prior to the introduction of *Index Chemicus* in August 1960, chemists had to wait from two to five years to obtain this same information from conventional abstracting services. Now the information is available within 60 days.

**Secretary of Agriculture Orville L. Freeman will open the OPEDA Science Fair Exhibit on April 26** in the Agriculture Department patio, at 9:30 a.m. Sponsored by the Organization of Professional Employees of the Department of Agriculture, the exhibit will provide an opportunity for about 50 Washington Area high school students to put their scientific skills and ingenuity on public display following the science fairs in their own areas. At this fourth annual event, science teachers of the area are particularly invited to bring their classes to visit the exhibit, which will be on view through April 28.

## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington .....	LAWSON M. MCKENZIE
Anthropological Society of Washington .....	REGINA FLANNERY HERZFELD
Biological Society of Washington .....	HERBERT FRIEDMANN
Chemical Society of Washington .....	JOHN L. TORGESEN
Entomological Society of Washington .....	WILLIAM E. BICKLEY
National Geographic Society .....	ALEXANDER WETMORE
Geological Society of Washington .....	MARGARET D. FOSTER
Medical Society of the District of Columbia .....	FREDERICK O. COE
Columbia Historical Society .....	U. S. GRANT, III
Botanical Society of Washington .....	HAROLD T. COOK
Society of American Foresters .....	G. FLIPPO GRAVATT
Washington Society of Engineers .....	HOWARD S. RAPPEYE
American Institute of Electrical Engineers .....	WILLIAM A. GEYGER
American Society of Mechanical Engineers .....	WILLIAM G. ALLEN
Helminthological Society of Washington .....	DOYS A. SHORB
Society of American Bacteriologists .....	MARY LOUISE ROBBINS
Institute of Radio Engineers .....	ROBERT D. HUNTOON
American Society of Civil Engineers .....	DOUGLAS E. PARSONS
Society for Experimental Biology and Medicine .....	KATHRYN KNOWLTON
American Society for Metals .....	JOHN A. BENNETT
International Association for Dental Research .....	GERHARD BRAUER
Institute of the Aerospace Sciences .....	FRANCOIS N. FRENKIEL
American Meteorological Society .....	JACK THOMPSON
Insecticide Society of Washington .....	MILTON S. SCHECHTER
Acoustical Society of America .....	RICHARD K. COOK
American Nuclear Society .....	URNER LIDDEL



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# JOURNAL of the WASHINGTON ACADEMY of SCIENCES

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**Editor:** SAMUEL B. DETWILER, JR., Department of Agriculture

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RICHARD P. FARROW, National Cannery Association

## Contributors

ALBERT M. STONE, Applied Physics Laboratory      ALPHONSE F. FORZIATI, National Bureau of Standards  
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ELLIOTT B. ROBERTS, Coast & Geodetic Survey      EILEEN E. STEWART, National Science Foundation  
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FRANK L. CAMPBELL, NAS-NRC      WILLIAM J. BAILEY, University of Maryland

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# On the Problems of Mineralogy \*

V. M. Goldschmidt

*Translated by Gunnar Kullerud*

Today [September 28, 1914], as I am about to assume my new position as professor at the University of Oslo, I consider it appropriate to choose for a lecture a topic of a rather comprehensive nature. When one is about to start a new chapter in his life work, he realizes the necessity of looking away from the special investiga-

tions of the day and feels the need of a general orientation about the problems that demand a solution and the working tools that we have at our disposal.

We shall attempt to present the status of mineralogical science; and try to shed some light on the existing problems, on the working techniques that are employed, and on the results that so far have been obtained.

The historical evolution of mineralogy has much in common with that of the other natural sciences; mineralogy started as a purely descriptive science.

The different minerals that were found in nature were described in the same manner as plants or animals. It was quite natural at first that attention was primarily directed to the outer features of the minerals, and especially to their regular outer form which is limited by plane, polygonal faces. Almost all minerals form crystals, and it was early noticed that their outer forms are very characteristic for the different mineral species. Therefore, it became possible to draw conclusions concerning the identity of a mineral from its crystal faces.

For this reason it is not fortuitous that the rapid growth of mineralogy as a true science coincided with the time when the shapes of crystals were found to conform to the laws of geometry through the fundamental investigations by Renée Haüy at the end of the 18th century.

The numerous investigations of the geometrical forms of crystals led to the construction of a special type of measuring instrument, the so-called goniometer. These instruments are designed to measure the angles between adjacent crystal faces. They were originally rather primitive and would

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\* Published here completely in English for the first time, this is primarily an address of historical interest to earth scientists; secondarily, an account of the early development of mineralogy that should be informative to all scientists unacquainted with the subject. At the suggestion of George T. Faust, U.S. Geological Survey, the address has been translated from Norwegian (*Naturen* 38, 321-334 (1914)) into English by Gunnar Kullerud of the Geophysical Laboratory, Carnegie Institution of Washington.

V. M. Goldschmidt (1888-1947) was noted for his contributions to geochemistry. He was educated in Oslo, took his doctor's degree in 1911, and became a professor in the University and head of its Mineralogical Institute in 1914, an event commemorated by the address here translated. In it he discussed what earth scientists now call the facies principle, having to do with deductions on the distribution of minerals according to the laws of thermodynamics applied to their formation under various conditions of temperature and pressure. His address is frequently cited with reference to this mineralogical phase rule.

Professor Goldschmidt left Oslo for Göttingen in 1929. There he published an important series of papers entitled, "Geochemische Verteilungsgesetze der Elemente." He returned to Oslo in 1935, then was a refugee during World War II, working in Sweden and England. Before he died in 1947 he had been at work on a summation in English of his scientific experience, to be published as a book. This work was completed and edited by Alex Muir. Entitled "Geochemistry," this 730-page book was published in 1954 by the Clarendon Press of Oxford. Of it a reviewer wrote, "This large and handsome volume is a fitting tribute to the memory of Victor Moritz Goldschmidt and his pioneer work in geochemistry."—Ed.

only permit the measurements to be performed with an accuracy of 1 or  $\frac{1}{2}$  degree. However, at the present time crystal angles normally are measured with an accuracy of 1 minute, and with the most modern instruments an investigation of even the most complicated crystals can be completed in a rather short time.

Thus, crystallography from the very beginning served to help mineralogy; when a mineral's crystal form once had been measured and described accurately, the limitation of the crystal faces could later be used for the determination of this mineral species.

It would take us too far astray to discuss how crystallography has developed into an independent science, and how it very soon was no longer limited to the study of the outer shape of crystals, but also extended to the problem of the physical conditions that separate crystals from non-crystalline substances.

However, there is one special branch of crystal physics that we ought to stress. This is crystal optics; i.e., the study of the transmission of light through crystalline bodies. Crystal optics is a science that already has obtained its most important results, and for the most important minerals the optical constants are now known with great accuracy.

Optical investigations are of special importance to mineralogy because the optical constants serve as an excellent tool for mineral identification. As soon as we have determined the measurable optical properties quantitatively, such as refractive indices, axial orientations, etc., it is easy to identify minerals from the existing optical determinative tables.

Optical methods of mineral identification have one great advantage over all other methods because they can be applied even when the mineral occurs as microscopic grains.

As an aid to mineralogy and petrography, a special branch of applied crystal optics has been developed. This is the determination of optical constants by means

of the polarizing microscope. Based upon the new exact methods, which mostly have been developed by Frederick Becke in Vienna, we can now determine the most important optical constants on mineral grains which are no bigger than 0.01 mm.

In addition to the optical methods there are also a whole series of other physical methods that are used for mineral diagnosis, such as density determination, and many others. It would take us too far from our subject to mention all these methods here. I shall mention in passing only one method that has proven valuable for the determination of numerous Norwegian minerals, and that is the method by which the radioactivity of minerals is quantitatively measured.

Through crystallography and crystal physics, mineralogy is closely bound to the physical sciences, and it is often difficult to decide whether a specific investigation should be considered of a physical or mineralogical nature.

In the meantime, the duties of descriptive mineralogy as a natural science are certainly not completed by the determination of the various physical properties of the minerals. Another area of greatest importance in the field of mineralogy is that concerning the chemical composition of minerals.

During the latter half of the 18th and the beginning of the 19th century, one of the most important tasks for chemists was to analyze minerals, to determine the elements in minerals, and the ratios between the amounts of these elements. In the field of mineral analysis the Swedish scientists have been the foremost leaders, and more than anyone else, Berzelius, who at the beginning of the last century developed analytical methods which in the main still form the basis for the present procedures.

Mineral-chemical studies have also been of great importance to the progress of chemistry. The investigation of the mineral argyrodite is a good example of this. In 1885, a new silver-containing mineral named argyrodite was found in one of the

Freiberg silver mines in Saxony. The well-known chemist Clemens Winkler undertook its analysis and found silver and sulfur to be the main constituents; however, the sum of these elements never totaled more than 93 or 94 percent of the weight of the starting material even after repeated analyses. In this way one was made aware of a new and unknown element, given the name germanium, that amounted to about 6 percent of the new mineral. Many elements were discovered by means of spectroanalytical investigations of minerals; I need only mention indium and gallium.

The accuracy required for mineral analyses is steadily increasing. First, improvements are often made in the analytical methods, mostly because constituents that are subordinate in amount and earlier were often overlooked, are now determined in the analysis. One of the consequences of this is that numerous elements that were previously considered to be very rare, such as vanadium, scandium, zirconium, and others, have proven to be outstandingly common as mineral constituents, even though in rather small amounts. Another point of importance is that the purity of minerals submitted for analysis must be assured. Earlier it was considered sufficient to pick the material by help of the naked eye to obtain a product pure enough for chemical analysis; today automatic methods are used to separate the mineral desired for chemical analysis from all admixed impurities. Among the modern methods devised to obtain pure material for analysis, the method of separation by differences in specific gravities, accomplished through suspension in heavy liquids, should be noted.

The importance of knowing the chemical composition of the individual minerals is apparent from the observation that the entire mineralogical system is based on the chemical composition of the minerals. Thus the two most important areas within the field of descriptive mineralogy are the crystallographic investigations and the de-

termination of the chemical composition of minerals.

If the results of both kinds of investigations are compared, it will be noted that important relations exist between the chemical compositions and the crystallographic forms of the minerals.

As early as 1819 Eilhard Mitscherlich found that substances possessing analogous chemical composition may be similar also in crystal form, a phenomenon which he called isomorphism. As examples of such minerals, we may mention the close crystallographic relations among the minerals barite, celestite, and anglesite, which are sulfuric salts of barium, strontium, and lead. All three crystallize in the orthorhombic crystal system and have nearly the same angular relations.

Such groups of crystallographically isomorphic and chemically analogous substances are very common among the minerals.

If a larger difference in chemistry exists between two crystalline substances, then the differences in crystal forms usually will increase. In some but not all cases, one may directly observe the changes in crystal forms that are caused by definite chemical substitutions. The peculiar group of humite minerals presents one of the most interesting examples of such a situation.

On this occasion I should like to remind you that it was a Norwegian scientist, Th. Hiortdahl, who in 1862 first discovered the laws governing these relations in this field which ties together chemistry and crystallography.

It is the responsibility of descriptive mineralogy to investigate and describe all the minerals that occur in nature. This task can in a general way be said to have been brought to a conclusion. Here and there further special investigations are, of course, required — little-known minerals have to be studied in further detail and old, out-dated investigations must be repeated using new and improved methods; but the study that is still to be accomplished is insignificantly small in compar-

ison with the work that has already been done.

The number of known mineral species at the present time is estimated at 1,000; a number which is not final, however, because new minerals are still to be discovered. In recent years, from six to ten valid mineral species have been discovered each year. Usually they do not yield information of special interest beyond that already learned from numerous older species. One of the few exceptions is the Norwegian mineral, thortveitite, which J. Schetelig described three years ago and which proved to be the first mineral to contain significant amounts of the interesting element scandium.

All in all, the contribution by Scandinavian scientists to the field of descriptive mineralogy must be evaluated very highly. I have tried to express this contribution by compiling statistically the discoveries of new mineral species. It appears that among the 1,000 known mineral species, Norwegian, Swedish, Danish, and Finnish mineralogists discovered more than 150; in other words, more than 15 percent of the total number. At least a score of these were described by Professor Brögger.

The responsibility of mineralogy, however, is not limited to investigations and descriptions of individual minerals. If the entire task amounted only to routine investigation of individual minerals, the job might as well be performed by chemists and physicists.

The distinction of minerals from other inorganic bodies is that minerals originate as products of nature, and for this reason the science dealing with the occurrence of minerals in nature forms a very essential part of the field of mineralogy.

If one wants to study a mineral, then it is not sufficient to investigate a number of museum specimens by means of chemical and physical methods; one must also study the mineral where it occurs in nature, study how it occurs, and observe the geological conditions under which it was formed.

Field observations show the existence of a multitude of different types of mineral occurrences. Some minerals occur only as primary components of igneous rocks; in other words, they must have been formed by solidification of glowing melts. Others are formed by sublimation that accompanies volcanic eruptions; and still others are deposited from thermal waters which have filled fissures in the crust of the earth. Some are formed by evaporation of concentrated salt solutions, others by chemical reactions between older minerals.

If we compiled the observations that exist on the occurrences of minerals in nature and listed them according to geological conditions, we would conclude that minerals can be grouped into a number of associations which embrace the minerals that commonly occur together under certain geological conditions. This concept of mineral association corresponds to the concept of fauna in zoology. Thus, a mineral association is composed of all the minerals which coexist under given physical conditions. I shall mention only a few examples of such mineral associations.

The examples that we here are most apt to cite are the minerals which from the beginning of the last century have made southern Norway a famous locality among mineralogists. I refer to the minerals from the Langesund region not only because it is conveniently nearby, but also because its mineral association is the first which has been exhaustively investigated by modern methods. In a paper of 1890. Brögger gave a prototype for all future investigations of this kind.

Minerals of the Langesund region occur in coarsely grained dikes, so-called pegmatites consisting of nepheline syenite. These pegmatites that accompany larger eruptive masses of nepheline syenite have been found to be especially rich in elements otherwise rare, such as zirconium, thorium, and the rare earths yttrium and cerium, etc. The pegmatites are also rich in gases which were dissolved in the melt.



among which water vapor and combinations of fluorine and boron must have played an important role. As a consequence of the peculiar chemical composition of these pegmatites, a rich multitude of rare minerals have formed. A considerable number have never been found previously in other localities. Some of the Langesund minerals were separately investigated earlier by the methods of descriptive mineralogy: however, Brögger was the first investigator to perceive the importance of treating all the minerals as a group, in which the occurrence of each mineral must be considered in connection with the others.

Closely related mineral occurrences are also found in other localities, especially in Greenland, where nepheline syenites occur with the pegmatites.

Another type of mineral occurrence that excels because of its special association is the so-called Alpine mineral fissures that were first studied in the Swiss Alps. These minerals were deposited from aqueous solutions in rock fissures that were formed during the mountain-folding period. These occurrences are characterized by beautifully developed quartz crystals, titanium oxide minerals, alkali feldspars, chlorite, and phosphates. These minerals also are the product of defined geological conditions and occur in all localities where the appropriate geological conditions prevailed. They are characteristic of the Norwegian mountain areas.

Another mineral association that might be mentioned is that found in contact metamorphosed limestones, and we need not go farther than to the area around Grefsen to study these minerals, which occur in all localities where limestones are in contact with younger igneous rocks.

Knowledge of the occurrence of minerals in nature contains a chapter of utmost practical importance: the investigation of the economically valuable minerals and their occurrence; the study of ore deposits. In reality, mining of all types is nothing but applied mineralogy.

The two important branches of mineralogy outlined in this paper have provided a vast empirical knowledge; i.e., the study of the occurrence and properties of minerals. However, from a scientific point of view it is not sufficient to possess only a large amount of observational information; it is embodied in the very spirit of science to demand a logical connection between the individual observations, a tie-in of the various facts by means of established causality laws.

Thermodynamics, the basis for all exact thinking within the field of natural sciences, alone can provide mineralogy with the desired causality laws. It is that branch of science which shows us how the equilibrium relations found in nature are conditioned by the three main theses expressed in the theory of heat. When we apply thermodynamics to mineralogical problems, we must consider mineral formation as a chemical process, the final product of which is represented by the minerals. All chemical reactions lead to a final equilibrium situation according to the law of mass action expressed by Guldberg and Waage.

Thermodynamic considerations have been applied to various mineral-forming processes. The first pioneering work in this field was performed by the Dutchman, Van't Hoff, the famous physical chemist who solved the problem of mineral formations in salt deposits.

In central Germany, especially near the city of Stassfurt, there are enormous deposits of rock salts and of potassium salts which were formed in ancient geological times by evaporation of extensive seas. In these massive deposits all kinds of minerals abound, especially chlorides and sulfates of sodium, potassium, calcium, and magnesium; partly as single salts, partly as complex compounds, partly anhydrous, and partly as hydrates. All these salt minerals occur in many different combinations.

Van't Hoff considered from the thermodynamic point of view the question of the equilibrium conditions which will occur

when a large volume of sea water is exposed to evaporation, and which salts will crystallize and in what order. The result of this investigation shows an excellent agreement between thermodynamic theory and mineralogical experience.<sup>1</sup> The minerals which occur in the central German salt deposits, as well as their mode of occurrence, are in complete agreement with theory. Consequently, we have here an example of a mineral-rich association that has been formed under conditions which we have clarified by means of the laws of thermodynamics.

We have in these deposits an example of minerals being formed by evaporation of the liquid in which they were dissolved, namely water. Another very simple process which leads to mineral formation is solidification of a melt by cooling. This mode of mineral formation is especially common in nature. The process is exemplified in any lava flow which erupts as a melt and later solidifies by cooling. Crystallization of this kind of melt is governed by very simple thermodynamic laws that were applied many years ago to the studies of the formation of alloys. Johann H. L. Vogt applied the laws governing the crystallization of melts to mineral formation during solidification of eruptive rocks. Also in this case, excellent agreement exists between the minerals that should form according to theory and those which were found to form in reality.

These two cases are easy to treat theoretically because we can continuously follow the change in the equilibrium relations during the entire period of time from the beginning of mineral formation until it is completed, both during crystallization of salt solutions and during solidification of melts. However, in most cases we

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<sup>1</sup>Certain salt compounds which cannot form directly by the natural evaporation of sea water, but which in spite of this sometimes occur in these salt deposits, were formed secondarily by reactions between the primary salt minerals. Also these processes of secondary mineral formation in salt deposits are in complete agreement with the laws of thermodynamics.

only know the system in its last stage represented by the observed minerals, and we do not know the earlier stages of the reaction.

Thermodynamics may be applied to these problems with very advantageous results because, as I have shown, each mineral occurrence in itself possesses the criteria which permit a decision whether we are faced with an equilibrium condition or not. A relationship exists between the number of coexisting minerals and the number of their chemical components, a relation to which I have given the name "the mineralogical phase rule." Provided equilibrium existed during mineral formations, this numerical relation must be fulfilled quite independently of the processes of mineral formation.

Some years ago I had the opportunity to test the validity of this law on the minerals which are associated with contact metamorphism. It can also explain many regularities in the occurrence of ore minerals, which I have shown by the example of silver-antimonisulfides, and the number of examples demonstrating the conformity to this law could be extended without difficulty. Thus, when we know the mineral paragenesis, and which minerals coexist, and what their compositions are, we can immediately decide whether equilibrium conditions were obtained.

What are the conditions for thermodynamic equilibrium, and why is it that we find some minerals in one occurrence and not in another? The answer is that equilibrium conditions depend upon three independently variable factors. The first of these is represented by the bulk chemical composition of the existing minerals: it tells us which starting material the mineral-forming processes had to work with. The two other factors are the temperature and the pressure under which crystallization took place. These factors depend upon the geological conditions of the mineral occurrence. From one given starting material different minerals may form, depending on the temperature and pressure.

In some cases we may from purely thermodynamic reasoning predict the temperature and pressure which must exist in order for certain mineral associations to be formed. One example of this, to which I once called attention, is the formation of calcium-rich silicates at the expense of calcium carbonate. This process can only take place within a certain pressure and temperature range. Thus, we have a method to determine the physical conditions, temperature and pressure, which have existed in the crust of the earth during mineral formation.

It is of course of great interest to be able to determine the physical conditions under which an individual mineral has been formed. It is of much greater importance not to limit such investigations to one single occurrence, but to study thoroughly a sizeable area in order to investigate the temperature-pressure distribution during a certain geological era.

Such an investigation, no doubt the first of its kind, is being performed by myself in the Norwegian mountain areas, from Ryfylke to Trondhjemsfjorden, in order to determine the temperature and pressure conditions in this part of the earth's crust during the formation of the Norwegian Caledonides at the beginning of the Devonian. The procedure of such a systematic investigation is as follows: rock specimens are collected a few kilometers apart and each specimen is studied by optical methods to recognize certain signs indicating the temperature and pressure which existed in the locality in question during the formation of the rock. The sum of all observations gives us a picture of the temperature-pressure distribution during the formation of a mountain chain.

After having investigated several thousand thin sections, I expect to finish these studies in the foreseeable future. Our knowledge of the conditions of mineral formation is partly based upon purely thermodynamic considerations. However, there is also another method which provides us with information concerning the

conditions existing during deposition of minerals; this is experimentation.

In the first half of the 19th century, attempts were made by laboratory experimentation to produce synthetic minerals identical to those which had been observed in nature. The experimentation was carried out in such a manner as to simulate the conditions which were assumed to have existed during the formation of the minerals in nature. The best-known result of mineral synthesis during this era is that of the French mineralogist Daubrée, who synthesized the mineral cassiterite,  $\text{SnO}_2$ . Cassiterite occurs in deposits which are assumed to have formed by volcanic gas exhalations of which particularly halogen species, fluorine- and chlorine-rich gases, are assumed to have played a significant role. Daubrée synthesized cassiterite crystals by letting tin chloride vapor and water vapor react at high temperature, and similar procedures served well for the synthesis of a great number of other minerals commonly associated with cassiterite.

A considerable number of the minerals which occurred in nature were gradually synthesized in the laboratory by many different methods, corresponding approximately to the many possibilities of mineral formation by natural processes. Some minerals were synthesized practically by coincidence, inasmuch as technical processes yielded as byproducts, minerals which earlier were known from nature: I only need to remind you of the minerals in metallurgical slags (particularly well known from the investigations by Professor Vogt), which so frequently are identical to those occurring in natural silicate rocks.

Mineral syntheses were sometimes of economic importance as well. I may mention here the synthesis of the two gem stones, ruby and sapphire, which are presently produced synthetically in such amounts that the natural minerals have practically lost their great value.

Scientific investigations in the field of mineral synthesis were previously satisfied

with growing the mineral in question and only recording the conditions of its formation in an approximate way. As the principles of thermodynamics began to be applied in the science of mineralogy, more was expected of the results of mineral synthesis. It was not sufficient any longer only to synthesize a mineral; it was also required to have the most detailed knowledge of the temperature-pressure conditions of the synthesis, as well as of the necessary chemical conditions. In other words, mineral syntheses had to be performed as quantitative precision investigations. Large difficulties blocked the progress of such projects. Precision studies had never been attempted before at such high temperatures, 1000° to 2000° C, where even the temperature scale was suffering from regrettable uncertainties. One specific institution must be given the credit for not only having made such investigations possible, but also for having completed numerous investigations of this kind; this is the Geophysical Laboratory of the Carnegie Institution of Washington. The publications of this Laboratory bring us every year descriptions of numerous important mineral syntheses performed by the most exact methods. The accompanying numerous scientific observational data give us the basic background for thermodynamic studies of natural minerals.

Mineral syntheses are likewise of great importance for purely descriptive mineralogy because the pure artificial minerals make it possible for us to determine the physical constants with greater accuracy than is possible with the corresponding natural material. Only one disadvantage is connected with the modern mineral synthesis—it requires exceedingly expensive experimental equipment. For this reason it is not possible at the present time to perform such investigations at the University of Oslo. However, we have in this country abundant material for investigations of all the interesting Norwegian mineral occurrences. Studies of this material will prove very fruitful and will especially augment our understanding of the thermo-

dynamic laws governing mineral formation.

As we have seen, mineralogy differs from most or all other natural sciences because its sphere of interest extends into so many different areas. Crystallography, experimental physics, analytical and synthetic chemistry, thermodynamics, and geology must be counted as the absolutely necessary background for mineralogical investigations. However, all these associated sciences have richly reaped the fruits of their cooperation with mineralogy. Crystal physics has, through mineral investigations, almost reached its goal—exploration of the constitution of the solid state. I shall mention in passing in this connection only the work by Laue and Bragg dealing with the application of X-rays in the field of crystallography.

Chemistry owes its thanks to the analysis of minerals and mineral products for the discovery of most elements. Geology is indebted to mineralogy now that it is becoming an exact natural science; it is the thermodynamic mineralogy which gives us numerical data concerning the temperature-pressure conditions prevailing in the earth's crust during geological processes, and these numbers will surely in the future form the basis for the exact mathematical treatment of the mechanics of geology.

After having attempted to survey the problems of mineralogy, the methods which are employed, and the results that so far have been obtained, one realizes involuntarily the great debt of gratitude he owes the generations of scientists who laid the foundation for our present studies, not least to the scientists here in Scandinavia who furnished an essential part of our mineralogical knowledge. I must be permitted to give special thanks to one particular man who has done such an important part of this work and who is also the educator of all the mineralogists of our time in the Scandinavian countries, the man to whom I myself owe so much for my scientific development—Professor Brøgger.

# The Amateur and the Academy \*

Frank L. Campbell

Mr. President and fellow members of the Academy:

I hope this evening to convince you that we are all amateurs with respect to the Washington Academy of Sciences, that the Academy should be proud of its amateur status, and that membership in the Academy should be thrown open to many more amateurs without limit.

Of course, I must define the word that is so important to my thesis. It is derived from the verb that every Latin student of my generation knew best: *amare*, to love. An amateur is a lover of some kind of human activity that some people are paid to pursue, but which he loves so much that he engages in it without pay. The amateur is always compared with the professional, and because the latter may be just as enthusiastic about his subject as the amateur and may have much more time to spend on it, the professional is likely to be more skillful or more productive than the amateur. Thus the word "amateur" has become slightly tainted in the sense of the adjective "amateurish." But I choose to use "amateur" only in the sports sense: the professional is paid, the amateur is not; their relative proficiency is irrelevant.

Obviously a person can be a professional in one subject and an amateur in others. Most of the members of the Academy were elected because they were successful professionals; thereafter they became amateurs with respect to the activities of the Academy, serving as officers or members of committees, attending meetings, helping

young people in various ways, serving on the staff of the *Journal*, etc. Their specialized knowledge and ideas are of little use in the Academy, because they can be fully understood, appreciated, and criticized only by other specialists. There is no provision in the Academy for meetings of specialists for critical discussion of work in progress. Such opportunities should be provided by the more specialized affiliated societies. The Academy, covering all branches of natural science, must of necessity appeal to amateurs, because only amateurs can take an interest in all scientific subjects, from atoms to anthropology, and from agriculture to aeronautics.

After all, what is the principal purpose of the Academy? To advance the frontiers of science? No; that is the function of scientific societies where specialists meet to stimulate one another. Is not the principal purpose of the Academy an educational one? To point out to all amateurs that there are frontiers of science to be explored, and to give them some idea of the joys of exploration and of what has been found and may lie ahead? Certainly the Academy is now acting as if mutual education of adults and encouragement of science talent among students were its chief functions. If this is true, all adults who want to participate ought to be members of the Academy. We should have in the Academy not only older scientists whose work has been "recognized," but younger men and women on their way to recognition, science teachers of all ages, and intelligent people who recognize the importance of science in modern civilization and want to know more about it and its practitioners—people who want to keep up with their children or who have or want a hobby in science.

Is there anything wrong with broaden-

\*From the address of the retiring president, February 18, 1960. It consisted of the argumentation here printed, followed by information and commentary on pictures of tree flowers and insect eggs taken by amateurs Walter O'Kane and Alvah Peterson, respectively.—Ed.



ing the base of the Academy? It might be feared that an indiscriminating academy would no longer attract mature professionals who are willing to pay for the satisfaction of belonging to a somewhat exclusive organization. Some organizations maintain class and mass by setting up two categories of membership. Thus the present selected members of the Academy might become Fellows, and anyone upon application might become an ordinary member, subject to advancement to Fellow when qualified. I am not convinced that this system would be better for the Academy than a single category of membership open to all upon application and payment of dues. One can be sure that no selection committee can be completely omniscient and unbiased. My inclination, therefore, is simply to open the doors of the Academy to all who will pay dues, and let recognition come naturally to those who have earned it through their work, both as professionals or amateurs outside the Academy and as amateurs inside.

In one way or another the Academy should greatly increase its membership, not only to bring its income up to its expenses, but to carry out more effectively its major purpose in the community. Other state and municipal academies do not restrict their membership; but on the other hand few, if any, have numerous affiliated societies like those connected with the Washington Academy. It may be argued that the Washington Academy would be competing with its affiliated societies if it were to solicit members in the Washington area. I think it very unlikely that a person eligible for both would choose the Academy instead of an affiliated society nearest to his interests. However, there should be many not interested in any affiliated society who might be attracted to the Academy: e.g., secondary school science teachers, unspecialized professionals concerned with science, and pure amateurs.

I have no idea how many adult amateurs might be at large and susceptible to attraction into the Academy. We know,

of course, that there are many nature lovers who go out with field glasses and cameras to sharpen their knowledge and appreciation of birds, trees, flowers, etc. This observational fact finding is the beginning of science. An estimate of the numbers of local amateur naturalists could probably be obtained from the chief naturalist of the National Capital Parks, whose organization exists to help them. At present the Academy has little to offer them, but it could build up services for senior amateurs as effective as those it has already devised for junior amateurs. The way has been pointed out by the Maryland Academy of Sciences, which has set up three affiliated societies for amateurs: (1) archeology, (2) astronomy, and (3) mineralogy. At the meetings of these societies, amateurs can report their observations and show their specimens or equipment, and they can learn from professionals who work with them. The local societies affiliated with the Academy that I happen to know tend to be social organizations of professionals; they do not cater to amateurs.

I was once a professional entomologist, but since World War II I have become an amateur in entomology and a professional servant of biological scientists. As an amateur in entomology, I should like to be a member of a society named, let us say, the L. O. Howard Society, an offshoot of the Academy or of the Entomological Society of Washington, composed of amateur observers, collectors, and photographers of insects. As retiring president of the Entomological Society of Washington, I suggested the encouragement of amateurs by that society, but I now think that the effort had better be made by the Academy as a part of a general program for the encouragement of senior amateurs.

A great proponent of amateur entomology is my first instructor in entomology at Rutgers University, Alvah Peterson. He became professor of entomology at the Ohio State University in 1928, with special responsibility for courses on the bi-

ological control of insects. Because he was there, I was happy to join the faculty of his department in 1936, and I was with him until World War II brought me back to Washington. He was a professional on biological control and a devoted amateur on the identification of immature insects, principally the larvae of insects. As his retirement approached in 1958, he began to study insect eggs, hoping that he could devote full time to them after age 70. The support he applied for was not immediately forthcoming, but he found a temporary job in entomology in Florida and became an amateur on insect eggs. He has also taken every opportunity to promote amateur entomology. Why, he wonders, are birds so much more popular than insects as objects of amateur study in the United States? Is it because all insects are regarded as pests, fit only to be killed? That is not true, of course. Relatively few species do any serious damage to man or his possessions, and relatively little is known about the species that are beneficial or of small economic importance. Whereas an amateur has little chance of contributing anything new to our knowledge of birds, except through banding, he might well add something to our knowledge of insects merely by taking pains to observe closely and frequently populations of any species that he may encounter. The late Austin H. Clark, whom some of you knew, was curator of echinoderms in the Smithsonian Institution. But he was also an enthusiastic

amateur entomologist and became an authority on the butterflies of Virginia. He was president of the Washington Academy of Sciences in 1941, a great scientist and ideal amateur whose knowledge and enthusiasm were infectious. What Mr. Clark accomplished, many others can also to a lesser degree.

Dr. Peterson has pointed out that although adult amateur entomology does not thrive in the United States, it does in Japan, where at least one amateur insect society exists in every city. Looking ahead, he wrote, "We might dream of a national amateur insect group comparable to the National Audubon Society . . . . Before this can take place, active, local, adult groups must be established in our cities . . . . Professional entomologists are in a position to help local groups . . ." I hope that Washington will be the first to establish a local, adult, amateur entomological society under the wing of our Academy. The Washington Junior Academy of Sciences also might establish a working group in entomology, or in any other subject of sufficient interest to enlist the attention of a number of students. I use entomology only by way of illustration.

This is the end of my serious message to the Academy. To summarize, I recommend opening membership in the Academy to all adults who are interested in its purposes, and I urge the establishment in the Academy of senior amateur study groups in various branches of natural science.

## Academy Receives NSF Grant

The National Science Foundation will grant \$26,775 to the Washington Academy of Sciences during fiscal year 1962, for the continuance of the Academy's program on science education. Approval of the grant was announced on April 7 by Harry C. Kelly, associate director of NSF.

The program supported by the grant will have a four-fold objective:

To maintain a roster of scientists and engineers willing to assist with educational activities;

To conduct a series of conferences on problems concerned with science teaching at the local level;

To sponsor and participate in the development of experimental educational courses in science;

To provide for a program of inter-academy contacts to improve science educational communications.

As has been the case for previous grants from the Foundation, the program will be administered by the Joint Board on Science Education. John K. Taylor is the Board's director of science projects, while G. Gravatt Coleman is its executive secretary. John W. Carroll operates the project office in the Academy's headquarters at 1530 P St., N.W.

The new program, which will get under way July 1, following termination of the present grant, will continue many of the present activities. The Visiting Scientist Program, which has been so successful this year, will be strengthened. The science teaching conferences will be extended to include discussions of science teaching at the elementary school level. The grant also makes it possible to continue the sponsorship of the experimental courses designed to correlate science and mathematics teaching.

A new feature will provide for an inter-academy conference to be held in the late

fall. Representatives from neighboring academies will be invited to discuss their respective programs in science education with the aim of coordinating their activities, especially in areas where their boundaries meet or overlap.

In preparation for the continuing program, the Joint Board is revising its roster of scientists and engineers willing to assist in educational activities. The present list includes more than 200 persons who have prepared illustrated and demonstration lectures for presentation to school classes, science clubs, and related groups. Most of them have been called upon at least once, and many have lectured several times during the past year. The list needs to be expanded—new subjects are needed to expand the scope of the list, and additional speakers for subjects already listed are needed to provide services on a wider basis.

Interested persons may phone the office of the Joint Board ( NO 7-3661) to obtain the brochure, "Visiting Scientists," which describes the program more fully.

## Special WAS Meeting Draws Crowd

Over 400 people attended a special Academy meeting on April 6, at the Carnegie Institution, to hear a discussion on living with a thermonuclear threat.

The speaker was Herman Kahn of the Rand Corporation, whose topic was, "Thinking about the Unthinkable."

Kahn, with a background of training in physics and applied mathematics, has been a Rand staff member since 1948, devoting his attention to problems of military planning and strategy. He is the author of the controversial book, "On Thermonuclear War."

The implications of thermonuclear warfare are decidedly unpleasant to consider, Kahn admits. But he takes the viewpoint that consideration of these implications and their consequences is highly important in

order to avoid such warfare or to survive it, if it does occur. He considers various "alternative national postures" and discusses "tragic but distinguishable post-war states" with the number of our dead ranging by steps from 2 million to 160 million and the time for economic recuperation ranging from 1 year to 100 years. He wonders at which of these states the survivors would envy the dead. He considers the elimination of the "unnecessary dead" as something "vastly worth doing." He differentiates between capacity for a limited war (lasting one day) or for a long war (lasting 2 to 30 days). "While thermonuclear war would probably be an unprecedented catastrophe for the defender, this is a far cry from an unlimited catastrophe. The limits of the catastrophe depend on the

kinds of preparations and on how the war is started and fought.”

From informal polls of the lay public, the lecturer concludes that the average American might be willing to see this country suffer from 10 to 60 million deaths if necessary in order to maintain our present way of life.

The discussion did not lead to any specific outline for action on either a national

or an individual scale. It implied that radiation meters should be made available to every individual.

The lecturer took spirited issue with critics of his book, who feel that considerations of this sort are too horrible to contemplate. In the present state of the world, he insists they are absolutely necessary for survival. In the longer run, if we do survive, he feels that disarmament and world government are the only real solutions to the problem.

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## MAY MEETING

(458th Regular Meeting of the Washington Academy of Sciences)

### SUBJECT

*Four-member Panel Discussion:  
“Are Science Fairs Hindering Science Education?”*

### PANELISTS

*Keith C. Johnson, D.C. Public Schools  
Doris E. Hadary, Bethesda-Chevy Chase High School  
Leo Schubert, American University  
Burrell Wood, Science Service*

### MODERATOR

*Philip H. Abelson, Geophysical Laboratory*

### DATE

*Thursday, May 18, 1961, 8:15 p.m.*

### PLACE

*John Wesley Powell Auditorium, Cosmos Club, 2170 Florida Ave., N.W.*

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors have been assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, care of Agricultural Marketing Service, U. S. Department of Agriculture, Rm. 3917 South Bldg., Washington 25, D. C.*

### CARNEGIE INSTITUTION OF WASHINGTON

**Merle A. Tuve**, director, Department of Terrestrial Magnetism, is chairman of the new Geophysics Research Board, National Academy of Sciences.

**Hatten S. Yoder, Jr.**, of the Geophysical Laboratory is head of an American panel organized under the Geophysics Research Board to consider studies on earth's mantle.

### COAST AND GEODETIC SURVEY

The Board of Geographic Names has approved the name of Roberts Inlet for an inlet in Berkner Island, Weddell Sea, Antarctica, in honor of **Capt. E. B. Roberts** (retired).

**D. S. Carder**, member of the Board of Directors, Seismological Society of America, presented a paper, co-authored with W. V. Mickey, on "Ground Effects from Underground Explosions" at the annual meeting of the Society in San Diego, Calif.

### GEOLOGICAL SURVEY

**George W. Morey** visited the Lawrence Radiation Laboratory in Livermore, Calif., and the laboratories of the U. S. Geological Survey in Menlo Park, Calif., March 6-9.

**Edwin W. Roedder** gave a paper before the Geological Society of Washington, March 22, on "Depression of the freezing point in fluid inclusions."

### GEORGE WASHINGTON UNIVERSITY

**H. George Mandel**, professor of pharmacology, recently became secretary-elect of the American Society for Pharmacology and Experimental Therapeutics.

**Paul W. Bowman**, professor of biology, will be attending the meetings of the American Association for Cancer Research and of the Federation, in Atlantic City.

**Mary L. Robbins**, Department of Bacteriology, spent a day recently at Far Rockaway High School, New York, as a visiting biologist under the auspices of AIBS, speaking to four separate classes on microbiology, medical science, and career problems and opportunities. In the evening she lectured on "The Biology of Viruses" to students and teachers and to the Rockaway Academy of Science.

### HARRIS RESEARCH LABORATORIES

**Alfred E. Brown**, former vice president, has been elected president of HRL. Dr. Brown remains director of research of the company, which he joined in 1945.

### NATIONAL BUREAU OF STANDARDS

The following talks have been given by members of the staff: **F. L. Alt**: "Recent Results in Machine Translation" at Massachusetts Institute of Technology, March 17; **R. G. Bates**: "Medium Effects in Ethanol-Water Solvents" at a Seminar on Special Topics in Physical Chemistry, Duke University, February 28; **L. M. Branscomb**: "Spectra and Electron Affinities of Gaseous Negative Ions" at Yale University, March 2; **H. P. Broida**: "Trapped Radicals"—Sigma Xi, McGill University, February 20, and Physics-Chemistry Colloquium, University of Western Ontario, February 21; **V. R. Deitz**: "The Rate of Physical Absorption at Low Surface Coverage"—American Chemical Society Colloid Division Symposium at St. Louis, in March; **C. Eisenhart**: "To Fit or Not to Fit: That is the Question" at the Statistics Seminar, Yale University, March 20, and Statistics Colloquium, Harvard University, March 22; **H. P. R. Frederikse**: "Properties of Rutile ( $\text{TiO}_2$ )" at the Department of Physics, Johns Hopkins University, March 9; **M. L. Greenough**: "FOS-DIC III, an Electr-Optical Scanner for Processing the 1960 Census Data" at the IRE (Professional Group on Electronic Computers), Washington, on March 1; **L. Marton**: "Some Aspects of Electron Physics" at the Department of Physics, New York University, March 14; **C. M. Herzfeld**: "Nuclear Orientation" at the Physics Department Colloquium, Duke University, March 8; **G. C. Paffenbarger**: "Dimensional Accuracy of Dentures" at the Berks County Dental Society, Reading, Pa., March 6; **E. K. Plyler**: "Vibration-Rotation Bands of  $\text{N}_2\text{O}$ " at Florida State University, March 14; **L. Rhodes**: "Machine Translation" at the Rochester, N. Y., Optical



Society of America meeting, March 21; **L. S. Taylor**: "Radiation Hazards and Common Sense" and "Opportunities for Scientific Work with the U. S. Government" at Harvard University, March 14-15; **C. E. Weir**: "Progress in High Pressure Research and Future Applications" at Annual Engineers, Scientists Day (Sponsored by the D. C. Council of Engineering and Architectural Societies and the Washington Academy of Sciences), February 23; **W. J. Youden**: "Better Answers with Less Work" at the Joint meeting of the Buffalo-Niagara Sections of American Statistical Association and the American Society for Quality Control, Tonowanda, N. Y., February 27; and "Applications of Statistics in Experiments at NBS" at the Johns Hopkins School of Hygiene and Public Health, March 10.

The following talks were presented before the Dental Materials Group, International Association for Dental Research, at Boston on March 23-26: **G. M. Brauer**: "Synthesis of 5-Methyl-2-propoxybenzoic Acid and Its Reaction with Zinc Oxide"; **G. C. Paffenbarger**: "Silico-Phosphate as Cementing Media"; **G. Dickson**: "Some Rheological Properties of Dental Amalgam."

The following talks were presented before the Fourth Symposium on Temperature, sponsored by the American Institute of Physics, Instrument Society of America, and the National Bureau of Standards at Columbus, Ohio, March 27-30: **H. J. Kostkowski**: "Some Equilibrium and Non-Equilibrium Characteristics of a Helium Plasma Arc" and "Theory and Methods of Optical Pyrometry"; and **A. G. McNish**: "The Role of Temperature in Our Measurement System."

**Ernest Ambler**, Cryogenic Physics Section, Heat Division, was one of the recipients of the Arthur S. Flemming Award for outstanding men in the Washington area. The award was presented by the Junior Chamber of Commerce of Washington on February 16.

**Charlotte M. Sitterly**, Spectroscopy Section, Atomic Physics Division, was one of the six recipients of the Federal Woman's Award for her outstanding contributions to the Federal Government in the field of astrophysics and spectroscopy. The award was presented to Dr. Sitterly by the Civil Service Commission on February 24. The award, the first of its kind, was established exclusively to honor career women chosen from the entire Federal Government.

The Exceptional Service Gold Medal Award has been given to **Lewis Branscomb**, chief of the Atomic Physics Division, for his very effective leadership and outstanding scientific contributions in the development of basic knowledge of the atomic processes of stellar atmospheres, the terrestrial ionosphere, and interplanetary

space; to **Thomas Digges**, chief of the Thermal Metallurgy Section, Metallurgy Division, for exceptional contributions to the science of metallurgy through his own research on a variety of metallurgical phenomena and through the organization and leadership of highly significant scientific programs at the managerial level; and to **Irl C. Schoonover**, associate director of the Bureau, for exceptional leadership of significance to the Department and the Nation on materials research, program and organization planning, and development and utilization of scientists; and for extraordinary versatility as a scientist-executive.

The Meritorious Service Silver Medal has been awarded to **Martin Greenspan**, physicist in the Sound Section, Mechanics division, for the development of an instrument which measures accurately and rapidly the speed of sound in natural waters, and which greatly facilitates research into the physics of sound in the sea; and to **John Torgesen**, physicist in the Pure Substances Section, Analytical and Inorganic Chemistry Division, for his studies of the growth of single crystals and mechanisms of purification.

**S. L. Madorsky** of the Polymer Structure Section, Organic and Fibrous Materials Division, retired at the end of February. A tea in his honor was held on February 28 in the Manse Lecture Room.

#### SMITHSONIAN INSTITUTION

**Herbert Friedmann**, who was head curator of zoology at the National Museum until his retirement on March 15, became director of the Los Angeles County Museum on April 1.

#### USDA, WASHINGTON

**Hazel K. Stiebeling** participated in meetings of the Joint FAO/WHO Advisory Committee on Nutrition, held in Geneva, Switzerland, April 18-25. She also will attend a meeting of the joint FAO/WHO Committee on Calcium, to be held in Rome, May 23-30.

**Edward H. Graham**, director of plant technology, Soil Conservation Service, is president of the International Commission on Ecology, which will hold its Sixth Meeting at Zurich, Switzerland, May 1-6. Two days will be devoted to business matters, followed by a Symposium on Coordination of Scientific Methods Used for the Study of Ecology in Holartic National Parks. A field trip will conclude the sessions. The Commission is an integral part of the International Union for Conservation of Nature and Natural Resources, and has served since its origin in 1954 as the scientific advisory body to the Union.

**Kenneth W. Parker** gave an illustrated talk on "Grasslands in Spain and France," at the March 1 meeting of the National Capital Section,

American Society of Range Management, which was held in the Department of Agriculture.

**Kenneth A. Haines**, Agricultural Research Service, attended the Sixth Session of the Technical Advisory Council, Inter-American Institute of Agricultural Sciences, held at San Jose, Costa Rica, March 6-10; he served as the United States representative on the Council. The Institute is an arm of the Organization of American States and has as its objectives graduate training and research in the field of agriculture.

#### USDA, BELTSVILLE

**C. H. Hoffmann**, Entomology Research Division, ARS, presented a paper entitled "Benefits and Limitations of Insecticides Used to Control Insects of Importance to Agriculture and Public Health" at the 7th Annual Conference of the Illinois Mosquito Control Association, held at Urbana, Ill., March 10.

**Erwin L. LeClerc** presented a series of 10 lectures on experimental design and applied statistics to a group of 20 entomologists at Vincennes, Ind., in early February, and to 25 research scientists at Belle Glade, Fla., in March. Both groups were employees of the Agricultural Research Service.

At the awards dinner of the National Grain Sorghum Research Committee at Amarillo, Tex., on March 7, the Grain Sorghum Producers Association presented **John H. Martin** with a "Plaque and a Scroll" for distinguished service to American agriculture in sorghum agronomy and physiology.

**S. L. Emsweller** was awarded a Certificate of Merit in February by the Michigan State Florists Association "in recognition and appreciation of his unselfish labor and achievement for the advancement of the floricultural industry."

**Myron S. Anderson** attended a meeting of the Iowa Academy of Science at Indianola, April 14-15, and spoke on the subject, "Soil Science as a Cultural Subject." While in Iowa, Dr. Anderson expected to present a short course on geology at William Penn College, Oskaloosa.

**Aurel O. Foster** has been appointed director of the USDA Parasitological Research Laboratories at Beltsville. In his new position, Dr. Foster will direct and coordinate USDA research programs in animal parasitology.

**Kermit W. Kreitlow**, research pathologist in the Crops Research Division, presented an invitational paper, "Diseases of Range Forage Plants and Their Effect on Range Management" at the annual meeting of the American Society of Range Management, held in Salt Lake City January 31-February 3.

**W. B. Ennis, Jr.**, chief of the Crops Protection Research Branch, Crops Research Division, ARS, presented an invitational paper entitled "Progress and Potential in Weed Investigations" at the 14th Annual Meeting of the Southern

Weed Conference, St. Petersburg, Fla., January 18-20.

#### UNCLASSIFIED

**Irving A. Denison**, a senior chemist on the staff of the Army's Diamond Ordnance Fuze Laboratories, retired on March 17 after more than 40 years of Federal service. He received the A.B. and M.S. degrees from the University of Illinois in 1920 and 1921, and the Ph.D. degree from George Washington University in 1929. He was appointed as chemist in the Department of Agriculture in 1922, and transferred to the National Bureau of Standards in 1929. In 1953, Dr. Denison transferred to the Diamond Ordnance Fuze Laboratories. He is well known for his research on corrosion of metals, and on fuel cells and other unique power supplies.

#### RETIREMENTS IN 1960

Harvey Chaplin, W. B. Emerson, John C. Lilly, Marvin Marcus, and Benjamin Schwartz.

#### DEATHS

**Walter E. Dove**, who would have been 67 years old on April 14, died on March 22. Dr. Dove was a native of Mississippi. He received the B.S. degree from Mississippi Agricultural and Mechanical College in 1913 and the Sc.D. degree from Johns Hopkins University in 1929. He was an entomologist in USDA's Bureau of Entomology from 1913 to 1945, except for about two years when he was in military service during World War I. He was research entomologist with U. S. Industrial Chemicals, Inc., from 1945 to 1954 and entomologist and parasitologist with Food Machinery and Chemicals Corporation from 1954 to 1959. Since 1959 he had been a consultant on insecticides. Dr. Dove was awarded a silver medal by the American Medical Association and received a citation from the Navy Department in recognition of his research on insects affecting man and animals.

**Russell S. McBride** died on April 3; he was 73 years old. A native of Minnesota, Mr. McBride received the B.S. degree from the University of Minnesota in 1908 and the M.S. degree from the University of Wisconsin in 1909. After working on the chemistry of fuels and gas at the National Bureau of Standards for 10 years, he became engineering representative for McGraw-Hill Publishing Company, and in 1921 became a consulting engineer. He continued this work for 40 years, numbering among his clients the Union Carbide Company, Olin Mathieson Chemical Corporation, the Coca Cola Company, and the Texas Power and Light Company. He was a former president of the Chemical Engineers Club of Washington and the Chemical Society of Washington.

## AFFILIATED SOCIETIES

*Where information as to the specific program scheduled for meetings of Affiliated Societies was not available sufficiently in advance to have been included in the Calendar of Events for the April issue of the Journal, it is carried below as a news item. Additional items considered of general interest are noted at appropriate points.*

### Acoustical Society of America, Washington Chapter

The final technical meeting of the year, April 17, featured a talk by Vincent Salmon of Stanford Research Institute, on "Factors Affecting the Reproduction of Sound." This gathering was held in the exhibit room of the Industrial Building, NBS, following an informal dinner at the Cafe Burgundy.

The May meeting will be a social gathering. This year, election of new officers will be conducted by mail ballot.

A recent survey of member interests produced lists of 20 and 30 persons, respectively, interested in participating in the Science Teacher Substitute Program and in Science Fair judging. These lists have been passed along to the Joint Board, accompanying a donation toward the financing of the Board. The Chapter contemplates making a certificate and gift award in its area to a local Science Fair winner.

### American Institute of Electrical Engineers, Washington Section

"The Polaris Submarine" was described by Cmdr. G. F. Moran at the April 11 meeting, attended by local members and by members of the National Marine Transportation Committee of the national organization, then meeting in Washington.

Election of officers for the coming year took place at the April general meeting.

Two technical discussion groups met in April: on the 4th the Division on Communications heard William Keister, Bell Telephone Laboratories, speak on "Progress in Electronic Switching—a System Trial at Morris, Ill.," and on the 18th the Power Division discussed "System Planning for Small Utilities and Large Industrial Plants."

### American Society of Civil Engineers, National Capital Section

The Section met on March 28 as host to the Washington Section of the Institute of Traffic Engineers. At this time, Francis C. Turner, Bureau of Public Roads, presented a current and comprehensive view of the "National Highway Program," described as the "greatest public works undertaking of all time."

Col. J. H. Kerkerling, Army Engineer Research and Development Laboratories, spoke to the group on April 6, at Ft. Belvoir, on "Camp Century—City Under Ice."

### American Society of Mechanical Engineers, Washington Section

Milton Slawsky, Air Force Office of Scientific Research, on April 13 discussed "Plasma Acceleration" and problems involved in applying these concepts to a propulsion system, based on current research and development.

New officers, elected at the last meeting in March, are Virgil L. Pence, chairman, John A. Cannon, vice-chairman, Robert O. Belsheim, secretary, and John W. Abouchar, treasurer.

### Botanical Society of Washington

Members of the Society met on April 4, at 5:30 p.m. for a tour of the National Arboretum, followed by a picnic supper, and a discussion by Director Skinner and his staff of the facilities and research program of the arboretum.

The final meeting, in May, will be the annual banquet.

### Chemical Society of Washington

A general meeting of the Society was held on April 13 at the National Museum. Linus Pauling, of California Institute of Technology, spoke on "The Structure of Electron-Deficient Substances."

### Entomological Society of Washington

Two papers comprised the Society program on April 6. The first, by Maj. R. M. Altman, Walter Reed Army Institute of Research, concerned "The Army Program of Insect Control in Panama," and the second, by A. M. Heimpel of USDA, dealt with "Use of Microorganisms in the Control of Forest Insects."

### Geological Society of Washington

Officers for 1961 are: President—C. Arthur Cooper; vice presidents—Harold M. Bannerman and Charles L. McGuinness; treasurer—Margaret Cooper; secretaries—Frank C. Whitmore, Jr., and John T. Hack.

The 822nd meeting of the Society, April 12, heard papers by T. P. Thayer, Geological Survey, on "Some Glimpses of the World Chromite Situation, Economic and Otherwise"; Catherine W. Skinner, NIH, on "Precipitation of Dolomite in South Australia"; and Philip H. Abelson and Thomas C. Hoering, Carnegie Institute, on "Fractionation of Carbon Isotopes by Living Matter."

### Helminthological Society of Washington

On April 21, the following program was presented to the Society at the Johns Hopkins University School of Hygiene and Public Health, Baltimore:

"Rous Sarcoma in the Embryonated Egg with Special Reference to Endothelium," by Helen V. Coates; "Studies in Pathogenicity of *Eimeria acervulina* in Chickens," by Stuart M. Krassner; and "Population Density Influence on Changes in the Chemical Composition of *Hymenolepis diminuta* During its Growth in the Definitive Host," by Larry S. Roberts. Four additional contributions were grouped under the general head-

ing, "Introduction to the Laboratory of Parasite Biochemistry."

#### **Insecticide Society of Washington**

"Nucleic Acid," was discussed by Norman Mitlin, USDA, on April 19 before the Society, accompanying a paper by J. R. Foster, University of Maryland, on "Maryland Mosquito Control Program."

#### **Institute of Radio Engineers, Washington Section**

What is described as an "outstanding advance" and an "amazing device," the Optical Maser, was discussed before the Section on April 10 by Donald F. Nelson of the Bell Telephone Laboratories. Apparently, this instrument is capable of producing a coherent, parallel beam of great intensity. Some of the scientific and technological uses of the ruby optical maser were demonstrated.

The Professional Group on Microwave Theory and Technics, meeting on April 11, heard C. T. McCoy of the Philco Corporation, speak on "Spectrum Utility in Space Communication."

#### **Medical Society of the District of Columbia**

In addition to its customary lengthy roster of medical events for the month, we received an early notice of a hobby show, or Doctors Hobby Exhibit, to be a feature of the 29th Annual Scientific Assembly, Statler-Hilton Hotel, on November 27-29 of this year. Apparently any hobby, provided it lends itself to exhibiting, is eligible and provision made for safekeeping overnight of valuable items.

We note, too, solicitation from members of nominations for the John Benjamin Nichols Award to a lay person or organization, or both, in recognition of unusual enterprise or service in the interest of better health for the people of the District. The award, a bronze plaque, must be to a recipient whose income is not derived from activity in the health field; it was established eight years ago by the Executive Board of the Society.

#### **Philosophical Society of Washington**

"Coesite and Craters" was the title of a talk by E. C. T. Chao, Geological Survey, on April 14.

#### **Society for Experimental Biology and Medicine, District of Columbia Section**

A series of four papers made up the March 30 program, each scheduled for 15 minutes:

"Carcinogenesis in the Newborn," Roger O'Gara, NIH; "Biochemical Studies of the Chick Edema Disease," D. F. Flick and Linda Gallo, FDA; "The Effect of Neo-Natal Cross Deimmunization on Tumor Transplant Susceptibility in Mice," J. M. Bailey and Keith Merrill, GWU; and "Transfer of Iron from Synthetic Iron-Binding Chelates to Rabbit Reticulocytes," G. Shashaty, E. J. Zapolski, M. Rubin, and J. V. Princiotto, GU.

#### **Society of American Bacteriologists, Washington Branch**

The annual meetings of the parent organization, held in Chicago April 23-27, made it advisable to cancel the Branch meeting for that month.

#### **Society of American Foresters, Washington Section**

On March 16, H. A. Fowells gave an illustrated lecture on his recent trip around the world, under the title "Jet's Eye View of Forestry Around the World." The April field trip will be the last meeting of the Section until next fall.

#### **Washington Society of Engineers**

The last meeting of the Society, on April 19, featured A. G. McNish of NBS in a talk on "Our System for Standards of Measurement," showing the trend to use of physical constants for this purpose.

It is expected that the biannual Roster will be completed and mailed very shortly.

## **CALENDAR OF EVENTS**

*Events which will take place, so far as we can determine at the time of writing, subsequent to the appearance of the Journal are noted below. Where possible, the nature of the program is indicated; in many instances the entry merely notes date and place of a regularly-scheduled meeting of the organization named. Last-minute changes in time and place, or emergency cancellations, may in certain instances alter the situation. At this time of year, too, certain local groups suspend formal meeting activities for the summer months.*

#### **May 8—Institute of Radio Engineers, Washington Section**

Museum of Natural History, 8:00 p.m.

#### **May 9—American Institute of Electrical Engineers, Washington Section**

PEPCO Auditorium, 8:00 p.m.

#### **May 9—American Society of Civil Engineers, National Capital Section**

John Wesley Powell Auditorium, 8:00 p.m.  
Presentation of slate of candidates for office.

#### **May 10—American Society for Metals, Washington Chapter**

National Officers Night. W. A. Pennington, national president, will speak on "Diffusion and Transport of Carbon in Ferrous Alloys."

AAUW Headquarters, 2401 Virginia Ave., N.W., 8:00 p.m. Dinner, 6:30 p.m.

#### **May 10—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

#### **May 10—Institute of Radio Engineers, Washington Section**

Meeting of Professional Group on Electron Devices.

**May 11—Chemical Society of Washington**

Annual "meeting-in-miniature."

University of Maryland. Dinner in University Dining Hall, 6:30 p.m. (\$2.75). Divisional sessions in Nathan L. Drake Lecture Hall of Chemistry, 8:15 p.m.

**May 11—American Society of Mechanical Engineers, Washington Section**

PEPCO Auditorium, 8:00 p.m.

**May 12—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

**May 15—Society of American Military Engineers, Washington Post**

Regular meeting combined with the annual meeting of the National Society of American Military Engineers.

**May 16—Anthropological Society of Washington**

Business meeting of the Society.

Room 43, U. S. National Museum, 8:15 p.m.

**May 16—Institute of the Aeronautical Sciences, Washington Section**

Thomas Finch, Flight Test Center, NASA, "The X-15, A Vehicle for Advanced Research."

Occidental Restaurant. Dinner, 6:00 p.m.; meeting, 8:00 p.m.

**May 15-17—Institute of Radio Engineers, Washington Section**

Professional Group on Microwave Theory and Technics National Symposium, Sheraton-Park Hotel.

**May 16—Institute of Radio Engineers, Washington Section**

Professional Group on Space Electronics and Telemetry.

**May 17—Insecticide Society of Washington**

L. D. Christenson, "Tropical Fruit Fly Population-Sterilization Research in Mexico, Hawaii, and the Western Pacific"; and E. F. Knipling, "Comments on Possibilities of Applying the Sterile Male Principle to the Control of Other Insects."

Symons Hall, University of Maryland, 8:00 p.m.

**May 18—Institute of Radio Engineers, Washington Section**

Professional Group on Antennas and Propagation.

**May 22—Institute of Radio Engineers, Washington Section**

Professional Group on Broadcasting, Elton Davis, FCC, "Automation of Directional Antenna Computation by FCC."

**May 23—American Society of Civil Engineers, National Capital Section**

Luncheon meeting.

YWCA, 12:00 noon.

**May 23—Anthropological Society of Washington**

Margaret Mead, American Museum of Natural History, "Theory and Methodology in the Study of Human Behavior."

Room 43, U. S. National Museum, 8:15 p.m.

**May 23—Society of American Bacteriologists, Washington Branch**

G. P. Gladstone, Oxford University and NIH, "Staphylococcal Leucocidins."

Sternberg Auditorium, Walter Reed, 8:00 p.m.

**May 24—Geological Society of Washington**

John Wesley Powell Auditorium, 8:00 p.m.

**May 24—Institute of Radio Engineers, Washington Section**

Professional Group on Engineering Writing and Speech, joint meeting with Society of Technical Writers and Publishers.

**May 25—American Society of Mechanical Engineers, Washington Section**

Meeting in area of product engineering.

PEPCO Auditorium, 8:00 p.m.

**May 26—Philosophical Society of Washington**

John Wesley Powell Auditorium, 8:15 p.m.

The following meetings, scheduled for June, have come to our attention:

**June 1—American Society of Mechanical Engineers, Washington Section**

Fuels symposium.

**June 1—Society for Experimental Biology and Medicine, District of Columbia Section**

Annual dinner meeting.

**June 12-13—Institute of Radio Engineers, Washington Section**

Third National Symposium on RFL.

**June 26-28—Institute of Radio Engineers, Washington Section**

Fifth National Symposium on Military Communications.

## ACADEMY ACTIVITIES

### APRIL BOARD MEETING

The Board of Managers held its 537th meeting on April 4 at the National Academy of Sciences, with President Abelson presiding. The minutes of the 536th meeting were approved with minor corrections.

Dr. Abelson discussed briefly the release of the Academy's full-time employee as of March 31, and its impact on the offices of secretary and treasurer. He indicated that for the time being, the Science Calendar would be maintained in the director's office at the Geophysical Laboratory; and the phone in the Academy office will be answered by Mr. Carroll of the Joint Board on Science Education, until other arrangements can be made. Mr. Detwiler pointed out



that maintenance of the Academy's mailing list was of great concern to the *Journal*; it was agreed that the secretary, treasurer, and editor would meet to set up procedures for handling the mailing list.

For the Meetings Committee, Dr. Abelson announced a special meeting of the Academy had been scheduled for April 6, at which Herman Kahn of the Rand Corporation would speak on "Thinking About the Unthinkable," with related comments by Marquis W. Childs and Frank T. McClure. At the regular meeting on April 20, Father Francis J. Heyden of Georgetown University was scheduled to speak on "Astronomy Looks to its Future."

Dr. Robbins reported that the Membership Committee had been drafting a statement on criteria for membership in the Academy, but that the statement was not yet ready for presentation to the Board. She announced that the Committee's roster of members was practically complete.

Dr. Robbins then presented for first reading the names of ten candidates for membership.

Dr. Campbell reported that the Policy and Planning Committee had met on March 30, and had discussed several topics, including (1) a recent recommendation by a science committee of the U. S. Chamber of Commerce, that basic and applied research in Government be abandoned; (2) Dr. Abelson's suggestion that the Board of Managers and the Joint Board on Science Education might foster the indoctrination of secondary-school students in the detection and estimation of radiation hazards, through training in the use of radiation monitoring devices; and (3) the encouragement of interest on the part of the Columbia Historical Society in the history of science in the Washington area. Recommendations concerning the first two topics may be brought before the Board at a subsequent meeting. Concerning the third topic, Dr. McPherson has volunteered to pursue the matter with the Columbia Historical Society.

Dr. Campbell suggested that the Academy should have a liaison with the Washington Board of Trade, specifically to get acquainted with the plans and planners of the National Cultural Center.

In the absence of Dr. Brenner of the Committee on Encouragement of Science Talent, the secretary read Dr. Brenner's report on the dinner held March 16 for superior science students and their teachers, and his recommendations for conduct of next year's dinner.

Following the second reading of their names, the following persons were elected to membership in the Academy: Mattie R. Fox, Albert L. Ryall, and Ronald E. Bowles.

Dr. Campbell presented an extensive report on the organization and operations of the New York Academy of Sciences.

## SCIENCE AND DEVELOPMENT

**Eleven young scientists are now conducting advanced basic studies at the National Bureau of Standards under the Postdoctoral Resident Research Associate program.** This program is sponsored jointly by the National Academy of Sciences—National Research Council and the Bureau; it is now in its seventh year. The plan provides advanced training in research for creative young scientists who have shown promise of leadership in fundamental research. Besides training, the program provides for a "cross-fertilization" of ideas, bringing the benefits of the scientist's new approaches and the results of his research to the organizations at which the research is performed and at which the scientist ultimately associates on a permanent basis. Research associateships have been awarded to 44 young men in the six years the plan has been in effect at NBS. Fourteen of the first 31 applied and were accepted as permanent members of the staff. The Naval Research Laboratory has a similar program.

**According to F. W. Reichelderfer, chief of the Weather Bureau, a new weather exchange linking the United States and Japan as part of an improved weather communications network was scheduled to begin operation on March 1.** Installation of the point-to-point radio teletypewriter circuit between Tokyo and Honolulu will complete the Northern Hemisphere Exchange Program started October 1, 1960. Five Northern Hemisphere Exchange Centers located at New York, Frankfurt, Moscow, New Delhi, and Tokyo, and connected by land-line and radio teletypewriter make it possible to receive weather data from the entire Northern Hemisphere at any regularly designated dissemination points. The next phase of the program will be the establishment of a similar network in the Southern Hemisphere, connected with the Northern Hemisphere network. Organization of this system is the result of several years of coordination and planning by members of the World Meteorological Organization and Agency of the United Nations.

**A National Oceanographic Data Center was established January 16 with administrative headquarters at the U. S. Hydrographic Office.** It is sponsored jointly by the Department of the Navy, Department of Commerce, Department of Interior, Atomic Energy Commission, and the National Science Foundation. It will serve as a repository for data on the physics, chemistry, biology, geology and meteorology of the oceans. It will prepare and publish indexes, summaries, and tabulations showing annual and seasonal oceanographic conditions, and promote the routine collection of ocean-wide survey data.

## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington	LAWSON M. MCKENZIE
Anthropological Society of Washington	REGINA FLANNERY HERZFELD
Biological Society of Washington	HERBERT FRIEDMANN
Chemical Society of Washington	JOHN L. TORGESEN
Entomological Society of Washington	WILLIAM E. BICKLEY
National Geographic Society	ALEXANDER WEIMORE
Geological Society of Washington	MARGARET D. FOSTER
Medical Society of the District of Columbia	FREDERICK O. COE
Columbia Historical Society	U. S. GRANT, III
Botanical Society of Washington	HAROLD T. COOK
Society of American Foresters	G. FLIPPO GRAVATT
Washington Society of Engineers	HOWARD S. RAFFLEYE
American Institute of Electrical Engineers	WILLIAM A. GEYGER
American Society of Mechanical Engineers	WILLIAM G. ALLEN
Helminthological Society of Washington	DOYS A. SHORB
Society of American Bacteriologists	MARY LOUISE ROBBINS
Institute of Radio Engineers	ROBERT D. HUNTOON
American Society of Civil Engineers	DOUGLAS E. PARSONS
Society for Experimental Biology and Medicine	KATHRYN KNOWLTON
American Society for Metals	JOHN A. BENNETT
International Association for Dental Research	GERHARD BRAUER
Institute of the Aerospace Sciences	FRANCOIS N. FRANKIEL
American Meteorological Society	JACK THOMPSON
Insecticide Society of Washington	MILTON S. SCHLICHTER
Acoustical Society of America	RICHARD K. COOK
American Nuclear Society	URNER LIDDEL

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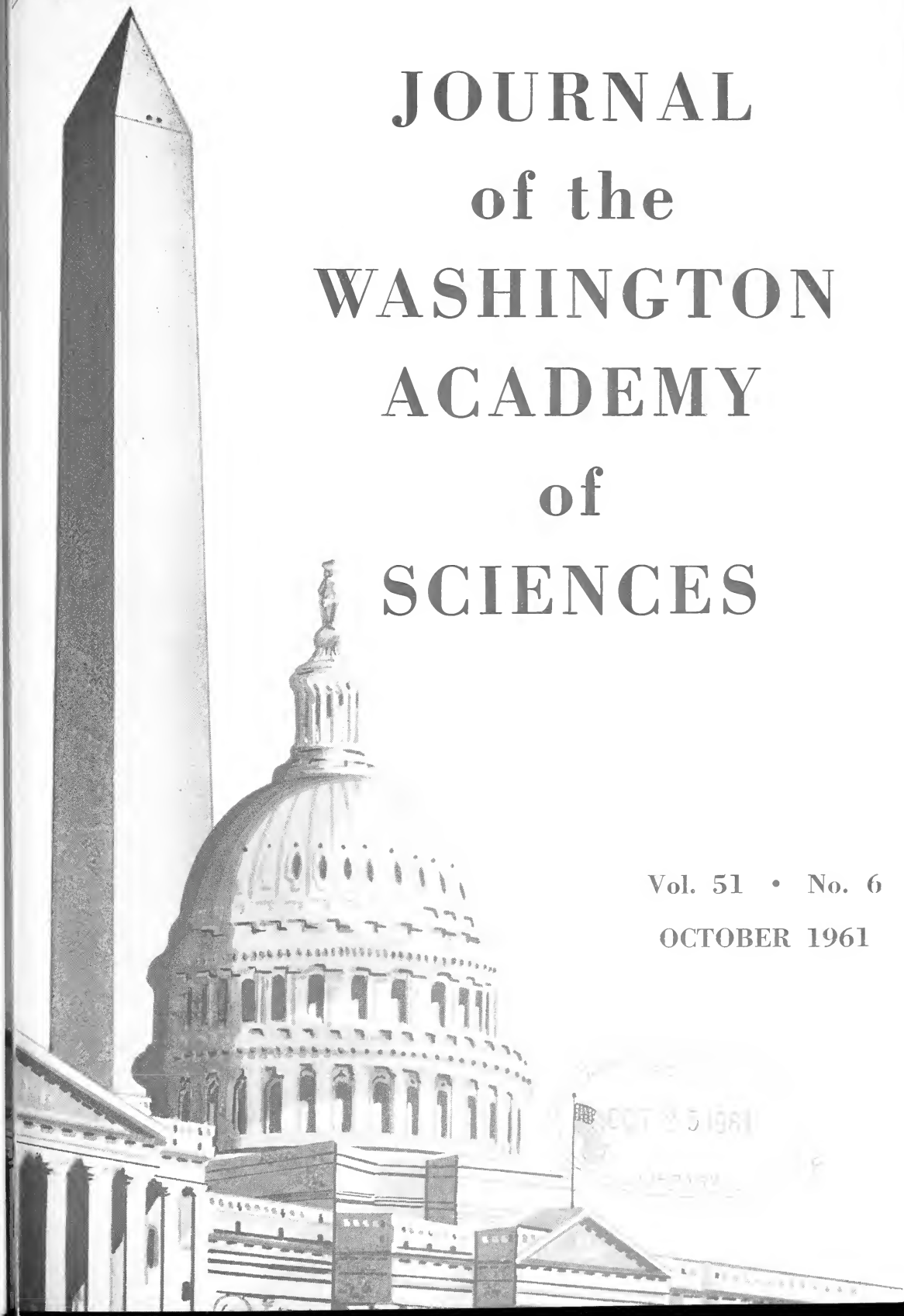
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# JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

Editor: SAMUEL B. DETWILER, JR., Department of Agriculture

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FRANK L. CAMPBELL, National Academy of Sciences      RUSSELL B. STEVENS, George Washington University  
HAROLD T. COOK, Department of Agriculture      JOHN K. TAYLOR, National Bureau of Standards  
LAWRENCE A. WOOD, National Bureau of Standards

## Staff Assistant

RICHARD P. FARROW, National Canners Association

## Contributors

ALBERT M. STONE, Applied Physics Laboratory	ALPHONSE F. FORZIATI, National Bureau of Standards
JOHN A. O'BRIEN, JR., Catholic University	
ELLIOTT B. ROBERTS, Coast & Geodetic Survey	HOWARD W. BOND, National Institutes of Health
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# Some Symbiotic Relations Between Saproglyphid Mites And Solitary Vespid Wasps\*

(Acarina, Saproglyphidae and Hymenoptera, Vespidae)

Karl V. Krombein

Entomology Research Division, U. S. Department of Agriculture

Several families of mites contain species that are parasites of solitary wasps and bees. Some of these mites, such as several species of *Pyemotes* (Trombidiformes, Pyemotidae), kill and feed on the more or less helpless immature stages of many insects. Other species belonging to the genera *Lackerbaueria*, *Tortonia*, and *Horstia* (Sarcoptiformes, Acaridae) or *Chaetodactylus* (Sarcoptiformes, Chaetodactylidae), have as host one or only a few species of solitary wasps or bees. Usually the adult mites belonging to these genera kill the host egg or larva and then develop and multiply as scavengers on the food stored by the mother wasp or bee. However, in at least one other family, species belonging to genera such as *Vespacarus*, *Monobiacarus*, *Ensliniella*, and *Kennethiella* (Sarcoptiformes, Saproglyphidae) have developed a very complex symbiotic relation with solitary wasps of the family Vespidae. The saproglyphid mites are nearly always host specific, each mite species occurring on only one species of vespid wasp.

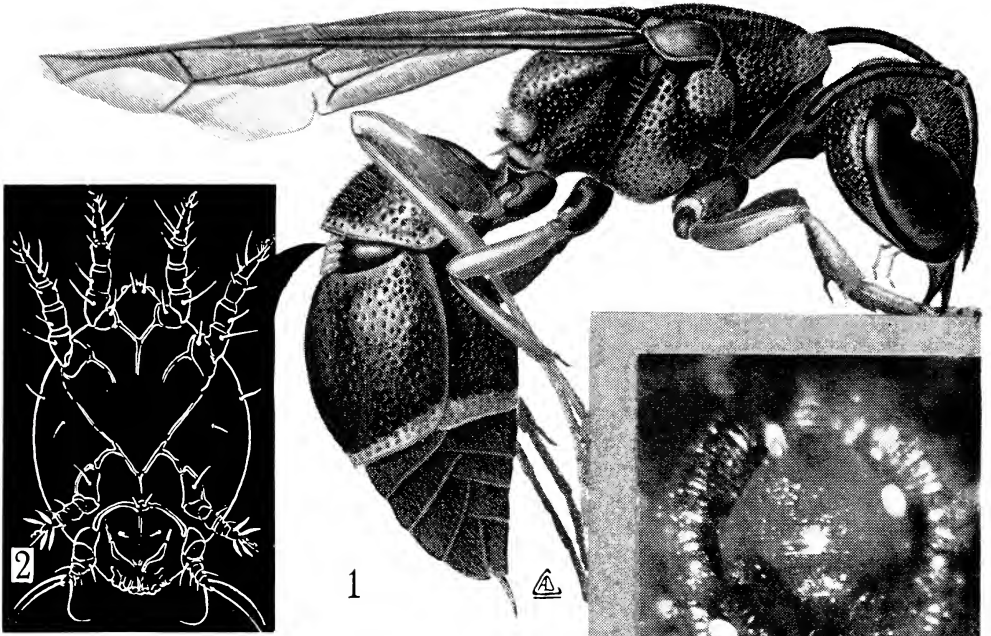
I have observed the life history of some saproglyphid mites during my studies of the solitary wasps that can be induced to nest in borings in wooden sticks. These artificial nesting sites are made in sticks of straight-grained pine  $\frac{3}{4}$  by  $\frac{3}{4}$  by  $6\frac{1}{2}$  inches. A boring 6 inches long having a diameter of  $\frac{3}{16}$ ,  $\frac{1}{4}$ , or  $\frac{1}{2}$  inch is drilled in each of the sticks. The traps are made up into bundles of six, each containing one or

two borings of each diameter. The bundles are set out horizontally in situations where wood-nesting solitary wasps are likely to search for nesting sites. Since vespid wasps do not gnaw out borings but merely take over abandoned borings of some other insect, usually those of beetles, these traps offer very desirable nesting sites. The most productive settings are on sound dead trunks or limbs containing abandoned beetle borings or on exterior structural timber containing similar borings. After completion the nest may be brought into the laboratory, split open, and observations made on the life history of the occupants.

## Life History of the Host Vespid Wasps

Species of *Stenodynerus* subg. *Parancistrocerus*, *Ancistrocerus*, and *Monobia* serve as hosts of *Vespacarus*, *Kennethiella*, and *Monobiacarus*. These wasps are similar in the main details of their life history. The female selects a boring of suitable diameter.  $\frac{3}{16}$  or  $\frac{1}{4}$  inch for *Stenodynerus* and *Ancistrocerus*,  $\frac{1}{2}$  inch for *Monobia*. She suspends her sausage-shaped egg by a slender thread from the ceiling of the boring near the inner end. Then she hunts for a caterpillar, paralyzes it by stinging, and flies with it to the nest. This caterpillar is stuffed into the inner end of the boring, and the wasp departs to hunt another. This process continues until about six to eight caterpillars have been stored. Then the wasp constructs a partition of agglutinated sand grains or mud several millimeters

\* Adapted from an address before the Entomological Society of Washington, March 2, 1961.



thick across the boring, to seal off that cell. Then another cell is stored, and so forth, until the boring is filled with a linear series of 4 to 10 cells. Frequently the wasp builds an empty vestibular cell between the last stored cell and the outer end of the boring, and sometimes, as in *Monobia*, she may build an empty intercalary cell between each of the stored cells.

The egg hatches in from two to four days and the legless, maggot-like larva devours in four to seven days all of the caterpillars stored for it. The mature larva spins a delicate silken cocoon which completely encloses the larva in *Stenodynerus* and *Ancistrocerus*, and consists of just a vestigial cap in *Monobia*. The meconium (accumulated fecal wastes) is voided into the posterior end of the cocoon, and the larva becomes a quiescent resting form. In the summer generation or generations pupation occurs four to seven days after completion of the cocoon, but in the overwintering generation the wasp overwinters as a diapausing larva and transforms into a pupa the following spring. The pupal stage lasts 10 to 17 days. After casting the pupal exuvia, the adult remains in the cell several days while the integument hardens. The wasps then chew through the cell partitions, leave the nest, mate, and begin another reproductive cycle.

### The Acarinarium

The hypopi (resting stage) of saproglyphid mites occupy a specialized area called an acarinarium (fig. 1) on or in the body of the adult vespid wasps. The hypopi (fig.

2) cluster on or in this area in regular, shingled rows and attach to the host or to each other by a ventral suctional plate on the apex of the abdomen. The acarinarium may consist of just the flattened, polished lateral and posterior surfaces of the propodeum (hind part of the thorax) as in *Ancistrocerus antilope* which has as its symbiont *Kennethiella trisetosa*. Or, the mites may cluster on the ventral side of the apical margin of one or more of the apical abdominal terga as does *Vespacarus tigris*, the symbiont of *Ancistrocerus tigris*. Or, there may be a definite internal chamber as in *Stenodynerus* subg. *Parancistrocerus* and *Monobia* which harbor other species of *Vespacarus* and *Monobiacarus*. This chamber is formed by the depressed anterior part of the second abdominal tergum which is normally covered by the apex of the first tergum except when the abdomen is flexed downward.

### Life History of the Saproglyphid Mites

The developmental stages of the mites consist of the egg, a six-legged larva, an eight-legged first nymph or protonymph, an eight-legged second or deutonymph usually called the hypopus in sarcoptiform mites, an eight-legged third or tritonymph, and adult females and males. The larva, protonymph, tritonymph, and adult have functional mouthparts. The deutonymph (hypopus) is a resting stage; it lacks mouthparts and has a suctional plate on the venter of the abdomen by which it attaches to the adult host.

The mites are much smaller than the host wasps. Most *Stenodynerus* adults normally range from 8 to 12mm. in length. The hypopi of various species of *Vespacarus*, the parasites of *Stenodynerus*, range from 215 to 275 $\mu$  in length; adult males may be 320 to 530 $\mu$  long and gravid females from 530 to 815 $\mu$ . *Monobia* is a larger wasp, adults usually measuring 15 to 20 mm. in length. Its parasite, *Monobiacarus*, has hypopi only 250 $\mu$  long, but the adults are veritable giants, the male being 770 $\mu$  and gravid females 1150 to 1450 $\mu$  in length.

Figure 1.—*Stenodynerus* (*Parancistrocerus*) *saecularis rufulus* (mites have been removed from right half of acarinarium at base of second abdominal segment), 10X. Figure 2.—*Vespacarus saecularis* hypopus, ventral aspect, the symbiont of *Stenodynerus saecularis rufulus*, 106X. Figures 3-6.—*Stenodynerus* (*Parancistrocerus*) *fulvipes fulvipes* and its mite, *Vespacarus fulvipes*. Figure 3.—Young pupa with several gravid female mites and a few eggs, 7X. Figure 4.—Gravid female mite and eggs on head of pupa, 17X. Figure 5.—Mite eggs on head of pupa, 17X. Figure 6.—Mite nymphs on head of pupa, 24X. (Drawings by Arthur D. Cushman, photographs by the author.)



As in any successful symbiotic relation, the mite has adjusted its developmental cycle perfectly to that of the host wasp. The rhythmic pulsation of the wasp's abdomen during movement of the egg from the oviduct prior to oviposition may be the signal for as many as 20 hypopi to leave the wasp's body and drop off in the cell. Transformation of the mites to the tritonymphal and adult stages takes place in the interval of a few days between oviposition by the wasp and completion of feeding by the wasp larvae. The adult mites are on the wasp larva as it begins to spin, and they are enclosed in the finished cocoon. They begin to feed on the wasp larva as soon as it has voided the meconium and has assumed the quiescent form. In heavy infestations by saproglyphid mites the resting wasp larva is literally peppered with tiny black feeding punctures. However, I have never observed that this feeding is injurious to the wasp.

The engorged adult female mite ceases feeding and begins to lay eggs as soon as the wasp transforms to the pupal stage (figs. 3-4). Since the period between voiding of the meconium and pupation may be only several days for the summer generations to a number of months for the overwintering generation, it is necessary to postulate some factor in the wasp's development that initiates ovulation in the female mite. It seems most probable that this factor may be the cessation in production of the juvenile hormone at the time when the wasp pupa begins to develop within the last larval skin. The growth and differentiation hormone present in the body fluids of the wasp during this developmental period may then stimulate ovulation in the female mite when she feeds on these fluids.

The mite eggs are ovoid (fig. 5), those of *Vespacarus* being 150-170 $\mu$  long and 90-110 $\mu$  wide, and those of *Monobiacarus* about 200x100 $\mu$ . The species of *Vespacarus* deposit their eggs around the mouthparts and legs of the newly transformed wasp pupa, whereas *Monobiacarus* lays its eggs on the cell walls and partitions. A gravid female mite may lay up to 20 eggs over a period of 10 to 15 days.

The six-legged larvae of *Vespacarus* hatch 6 to 15 days after oviposition, depending on nest temperatures. They are slightly larger than the eggs, ranging from 125-200 $\mu$  long and 55-155 $\mu$  wide, and have an ovoid shape. The larvae transform to eight-legged protonymphs (fig. 6) in less than 2 days. These nymphs are larger than the larvae, ovoid in shape, and range from 250-300 $\mu$  long and 150-165 $\mu$  wide. Both the larvae and protonymphs wander more or less freely over the body of the pupa.

Most of the mites are in the protonymphal stage when the adult wasp is ready to shed the pupal exuvia, about 17 to 21 days after pupation occurs. As eclosion draws near, the mites cluster on the venter of the wasp around the mouthparts and legs. They are shed along with the pupal exuvia, and in a very brief time transform to the deutonymphal state (hypopus). The hypopus (fig. 2) has an oval, flattened, more sclerotized body. Those of *Vespacarus* range from 215 to 320 $\mu$  in length.

The *Vespacarus* hypopi soon leave the pupal exuvia, clamber on to the tip of the wasp's abdomen, and crawl forward on the dorsum until they reach the apical margin of the depressed acarinarium at the base of the second abdominal segment. Then the hypopi turn around and back into the acarinarium. As additional hypopi perform this same maneuver they come to lie in shingled rows until the acarinarium is full. The mites are then ready to infest a new nest if they happen to be on a female instead of a male wasp.

The mite *Kennethiella trisetosa* has a more complex relationship with its host, *Ancistrocerus antilope* \*. The female wasp larva eats the adult mites in the cell with it before spinning a cocoon, but the male wasp does not harm the mites in its cell. Consequently, when the adult wasps leave the nests only the males are infested with hy-

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\* Cooper, K. W. "Venereal Transmission of Mites by Wasps, and Some Evolutionary Problems Arising from the Remarkable Association of *Ensliniella trisetosa* with the Wasp *Ancistrocerus antilope*." Trans. Amer. Ent. Soc. **80**, 119-174 (1955).

popi which cluster on the hind part of the thorax instead of in a specialized internal chamber. When an infested male wasp mates with a female, some of these mites

stream down the abdomen of the male and enter the genital chamber of the female, from whence they can infest each cell as the egg is laid.

# Academy Membership Increase Urged

**Mary L. Robbins**

*Chairman, WAS Committee on Membership.*

The Washington Academy of Sciences is the only organization which can speak and act for the entire metropolitan scientific community. To enable the Academy to realize its potential for service, its membership must be increased. At present its members represent only a fraction of those eligible in the area. As one way of reaching this large group of scientists, the Committee on Membership is appealing to each member of the Academy to recommend for membership those of his colleagues whom he considers to be eligible.

The current criteria for eligibility for membership represent the Committee's interpretation of the Bylaw reading, "Active members shall be persons who by reason of original research or scientific attainment are deemed worthy of the honor of election."

To meet the requirement for original research, a candidate must have had several years' experience and achieved recognition in a scientific field. A younger nominee must have a doctorate degree and several original contributions in addition to his thesis.

To meet the requirement of scientific at-

tainment, a candidate must be (1) an administrator of a scientific program who has achieved recognition in the direct administration of the conduct of research; (2) a person who has achieved recognition as a distinguished editor or leader in science; (3) a teacher of science who has achieved an outstanding record in the teaching of science students or in behalf of the science teaching professions; or (4) a person who has demonstrated leadership in a society affiliated with the Academy, as evidenced by election to office, particularly to the presidency, of such a society. A nominee for election in any of these four categories must have shown a satisfactory degree of creativity or productivity.

In order to acquaint every member with the process by which a nominee is elected, the procedures are outlined below, followed by the sections of Article II of the Bylaws which pertain to election of members.

The Committee on Membership sincerely hopes that, with the aid of every active member, a very significant increase in membership in the Washington Academy of Sciences will be achieved.

## Procedures for Election of Members to the Washington Academy of Sciences

1. a. A nomination, prepared on the official nomination form, is endorsed by

(usually) three members of the Academy (one "sponsor" and at least one, usually



two, "endorsers"). At least one sponsor must have knowledge of the nominee's field.

b. With the exception of the citation, the form may be filled out by the nominee.

c. The citation must be prepared by one of the sponsors, who may receive advice from other members of the Academy if he wishes.

2. The nomination, with supporting material, is submitted to the chairman of the Committee on Membership.

3. The chairman submits the nomination to the chairman of the appropriate panel for consideration and recommendation. The panels, each consisting of five members including the panel chairman, are as follows:

a. Agricultural Sciences

b. Chemistry

c. Earth Sciences

d. General Biology

e. Mathematical Sciences

f. Medical Sciences

g. Physics and Astronomy

(h. A panel on Engineering is in the process of establishment.)

If a nomination does not fit any of the categories represented by the panels, it is submitted directly to the Committee on Membership.

All members of the panel, including the chairman, vote on a nomination.

4. After consideration by the panel, the nomination is returned to the committee chairman with the recommendation of the panel.

5. a. If the nomination is approved by the panel, it is then presented to the Committee on Membership (usually represented by the chairmen of the various panels) for consideration and recommendation. Each member present at the meeting votes for or against recommending the nominee for election. The chairman votes only in case

of a tie.

b. If the panel recommends against election, the chairman of the Committee contacts the sponsor to give him an opportunity to withdraw the nomination. If the sponsor elects not to withdraw the nomination, he may submit it directly to the Board of Managers of the Academy.

c. If the panel is unable to reach a decision, the nomination is submitted to the Committee on Membership for consideration and recommendation as in 5 a above.

6. a. If the nomination is approved by the Committee on Membership, it is presented to the Board of Managers by the chairman of the Committee (the so-called "First Reading").

b. If the nomination is not approved by the Committee on Membership, the procedure outlined in 5 b above is followed.

7. At least one week after receiving the nomination (usually at the next monthly meeting), the Board of Managers votes for or against election of the nominee. Three-fourths of the votes cast must be in favor of election.

8. a. The secretary of the Academy notifies the nominee of his election and informs him that formal membership is attained after payment of the appropriate portion of the annual dues for the current year. Election becomes void if the person elected does not pay the dues within three months, or satisfactorily explain his failure to do so.

b. If a nominee is rejected by the Board of Managers, the secretary notifies the sponsor and informs him that a rejected candidate is not eligible for re-nomination within one year from the date of rejection.

9. Upon receipt of the dues, the secretary sends the new member the certificate of membership in the Washington Academy of Sciences.

## **Bylaws of the Washington Academy of Sciences**

### **Article II—Membership (Sections 1 through 4 only)**

Section 1. The membership shall consist (including those in life and emeritus status), honorary members, and patrons.

Section 2. Nominations for active membership shall be presented in writing at a meeting of the Board of Managers, each endorsed by at least two members of the Academy, one of whom shall have knowledge of the nominee's field. They shall be accompanied by a statement of the qualifications of the nominee and a list of his more important scientific publications and activities.

Section 3. Election to active membership shall be by vote of the Board of Managers. Final action on nominations shall be deferred at least one week after presentation to the Board and three-fourths of the vote cast shall be necessary to elect. An election to active membership shall be void if the

person elected does not within three months thereafter pay his dues or satisfactorily explain his failure to do so.

Section 4. Active members shall be persons who by reason of original research or scientific attainment are deemed worthy of the honor of election to Academy membership. They shall be classed as resident and non-resident, those living within 25 miles of the White House, Washington, D. C., being considered resident members. The number of active members shall not exceed 1500, of whom not more than 1200 shall be resident members, provided that non-resident may become resident members regardless of this limitation.

# What Is the Best Value?

**William J. Youden**

*National Bureau of Standards*

The accurate measurement of physical constants is a challenging and exacting task. To that end, the investigator directs his skills to the refinement of his apparatus and to the detection and elimination of sources of error in his measurements. Preoccupation with these endeavors may make it necessary to discard many measurements, otherwise the average will not truly represent the situation. The kind of problem that may arise will be illustrated by a hypothetical investigation of the gravity constant,  $g$ . For simplicity, assume that  $g$  will be estimated from measurements made with a falling object.

Let us assume that the falling object is a vertical rod with three lines engraved on it, and that the distances between these lines have been carefully measured. The time intervals required for these lines to pass a given point are now measured. We may suppose that a multitude of precautions have been taken and that repeated drops have been recorded. Let us also assume that the experimenter is fortunate in possessing a second rod. Careful meas-

urements on this second rod show that the distances between the lines on this rod are slightly different from those on the first rod. Nevertheless, when allowance is made for the values of the distances in the calculations, the average value for  $g$  obtained with the second rod should check the average value for  $g$  obtained with the first rod. For the sake of argument let the two averages, each based on the same number of drops, differ substantially more than is compatible with the precision of the measurements. The precision is based on measurements made with the same rod and apparently there is no difference in the two estimates of the precision. No change in the apparatus has been made other than the substitution of one rod for the other, therefore the difference in the two estimates for  $g$  may be ascribed to small uncertainties in the values assigned to the distances between the lines on the rods.

We now have two values for  $g$ , and no reason to believe that the distances on

one rod are more accurately known than the distances on the other rod. The obvious and proper "best" estimate for  $g$ , from these data, is obtained by "splitting the difference", i.e., taking the average of the two estimates, giving equal weight to the value obtained with each rod. This is an important rule and it should be adhered to in obtaining the best value from a collection of data.

Suppose that the investigator is indeed fortunate in that he also has available a second clock for measuring the time for the drop. For convenience, designate the two rods by  $R$  and  $r$  and the two clocks by  $C$  and  $c$ . There is a well-established practice of changing but one variable at a time, because this is the obvious way to detect the effect of changing a variable. Obvious it may be but, as we will see, it is usually not the best way. The experimenter may or may not change back to the first rod while he tries a third series of drops with the second clock. It really does not matter in this case, and we list the symbols that are associated with the three series of measurements.

First series of drops	$RC$
Second " " "	$rC$
Third " " "	$Rc$

Let the average for clock  $C$  differ from the average for clock  $c$ , the same rod being used, just as different averages were obtained for the two rods, using the same clock. The problem confronting the experimenter now is to compute an average that will give equal weight to the two clocks and also give equal weight to the two rods. Try as you may you will find no alternative to taking the average of the second and third series. (If the third series had been  $rc$ , the first and third series should be taken for the average. One series has to be discarded, in either event.) We presume that changing clocks or rods does have a small effect on the result. Indeed, the averages for the series are most unlikely to be identical and some averaging process is appropriate. The investigation affords an estimate of the effect of changing a variable

by taking the difference between the first and second series for the rods and between the first and third series for the clocks. The best *average* to report is the average of the second and third series. These two series clearly give equal weight to both rods and both clocks.

We now point out that if the fourth possible combination,  $rc$ , is also run as a series, the amount of information is doubled in all respects. Let the average for a series be denoted by the symbols identifying the series.

$$\text{Effect of rod change } \frac{RC + Rc}{2} - \frac{rC + rc}{2}$$

$$\text{Effect of clock change } \frac{RC + rC}{2} - \frac{Rc + rc}{2}$$

$$\text{Best average } \frac{RC + rc + Rc + rC}{4}$$

Here the effect of changing a variable is obtained by taking the difference between averages of two series, and the best average is the average of all *four* series.

The complications increase if a third variable is studied for a possible effect upon the results. In this hypothetical case, we propose that two observers,  $O$  and  $o$ , share the burden of making the measurements. There are now three variables to program. Listed below are three alternative schedules for making the measurements. In Schedule I only one variable is changed at a time. After the second series of drops has been made, the changed variable is restored to its initial condition and another variable changed. In Schedule II, once a variable has been changed it is left at its new value and a change made in some other variable. Finally, in Schedule III each series differs from the initial series in that *two* variables are changed together.

Series	Schedule I	Schedule II	Schedule III
1	$ROC$	$ROC$	$ROC$
2	$ROc$	$ROc$	$Roc$
3	$RoC$	$Roc$	$roC$
4	$roC$	$roc$	$roC$

We will now examine the three schedules with particular attention to obtaining a best

average of the data. The presumption is that there is nothing to guide one in choosing between rods, or between observers or between clocks. So the "best" value should give equal weight to the results obtained with the two rods, with the two observers, and with the two clocks.

Schedule I comes off very badly indeed. Denote the result obtained by any series by the identifying symbols. The best averages are:

$$\text{For Schedule I} \quad \frac{ROc + RoC + rOC - ROC}{2}$$

$$\text{For Schedule II} \quad \frac{ROC + roc}{2}$$

$$\text{For Schedule III} \quad \frac{ROC + RoC + rOC + rOc}{4}$$

The governing rule is that there must be equal numbers of capital and lower case for each letter *after* the summation in the numerator is accomplished. Thus Schedule I suffers severely from the necessary subtraction of the result obtained with *ROC*. Although after the subtraction, the numerator is equivalent to the sum of just two series, the errors of all four series are involved. The net result is that this average best value has the same precision as the result from just one series. Schedule II permits an average of two series and the random error of a single series is consequently divided by  $\sqrt{2}$ . Two of the series do not contribute at all to the best average. Schedule III provides a best value that is a straight average of all four series, cutting in half the random error of a single series.

Schedules I and II are both inferior to Schedule III in detecting the effect of changing any one of the variables. The effect of changing a variable for the first two schedules is revealed by taking the difference between just two of the series. Thus the effect of changing clocks is given by the difference between the *ROC* result and the *ROc* result. Such a difference has  $\sqrt{2}$  times the error of the result for a single series. Schedule III makes it possible to examine the effect of changing clocks by comparing averages of two series. The dif-

ference between

$$\frac{ROC + rOc}{2} \quad \text{and} \quad \frac{RoC + rOC}{2}$$

gives the effect of changing clocks. Scrutiny shows that the two series with clock *C* involve both rods and both observers. The same relation holds for the two series with clock *c*. Consequently, these averages provide an unbiased comparison of the clocks. The standard error associated with this difference between these averages is simply the standard error for a single series. In summary, Schedule III yields twice as much information for the same number of measurements as does Schedule II, and has an even greater advantage over Schedule I.

The importance of keeping in mind the computations necessary to get the proper and best estimate of the average, when two or more variables have been examined, can hardly be exaggerated. Imagine that the two observers follow Schedule I and mistakenly take the simple average of the four series as their estimate of the best value. Now suppose that these same two observers repeat the study using the identical apparatus, but that they now follow Schedule II because it avoids restoring a variable once it has been changed. The simple average for Schedule II will not converge on the average obtained using Schedule I. For example, three of the series in Schedule I were made with clock *C*, whereas in Schedule II, three of the series were made with clock *c*. If there is a difference between clocks, this biases the overall averages. Rarely will the clocks be identical.

The averages for the three schedules, if computed by the correct formulas given above, will all converge upon the same value. It is a fact, given a particular system with certain choices available for the variables, that there should be one value and just one correct value associated with the system. The correct formulas that do estimate this one value show that Schedule III has at least a two-fold advantage over the more traditional Schedules I or II.

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors are assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, U. S. Department of Agriculture, Agricultural Marketing Service, Room 2628 South Building, Washington 25, D. C.*

## APPLIED PHYSICS LABORATORY

**A. M. Stone** gave a talk on "Plasma Dynamics Research" on May 18, before U. S. Naval Research Ordnance Company 5-11, at the Naval Ordnance Laboratory, White Oak, Md. Dr. Stone is technical assistant to the director at APL. He also gave a lecture on "Thermonuclear Plasmas" to the Naval Air Reserve Training Unit at Anacostia Air Station on May 6.

**R. E. Gibson**, director, addressed the American Institute of Chemists on "The Systems Approach to Research Management," in Washington on April 11. Dr. Gibson also gave a lecture at Omaha, Neb., on May 4, on "Social and Economic Effects of Scientific Progress" to the Conference for Executives of Employment Security Agencies. On May 24 he addressed the Maryland Science-Industry Conference (convened by Gov. J. Millard Tawes) on "What Maryland Offers Science Industries."

A prize of \$250 will be awarded to **Archie J. Mahan** and **L. P. Bone** for the winning paper entitled, "Far-Field Diffraction Properties of a Plane-Parallel Plate When Placed Partially in Front of a Rectangular Diffracting Aperture." The award will be presented at the meeting of the Optical Society of America, October 18-20, at the Hotel Biltmore in Los Angeles. Dr. Mahan is a senior staff physicist and Mr. Bone an associate mathematician at APL.

**Alfred J. Zmuda** was appointed to the Panel on the World Magnetic Survey, a panel of the Geophysics Research Board of the National Academy of Sciences.

## COAST AND GEODETIC SURVEY

**Donald A. Rice**, chief of the Gravity and Astronomy Branch, Geodesy Division, attended the Symposium on Gravity Reductions held by the International Association of Geodesy at Cambridge, England, July 24-28.

**Dean S. Carder** was elected president of the Seismological Society of America, at a recent meeting of that Society.

A paper by **Dean S. Carder** and **W. V. Mickey** entitled "Ground Effects from Underground Explosions" has been accepted for publication in the *Bulletin* of the Seismological Society of America.

**Elliott B. Roberts**, assistant director for research and development, **Charles A. Whitten**, chief of the Triangulation Branch, Geodesy Division, and **Dean S. Carder**, chief seismologist of the Geophysics Division, were delegates to the 7th General Assembly of PAIGH and the 9th Pan American Consultation on Cartography, held in Buenos Aires August 1-15. Captain Roberts also attended the 10th Pacific Science Congress at the University of Hawaii, August 21 to September 6.

## HARRIS RESEARCH LABORATORIES

**Alfred E. Brown**, president and director of research, presented a paper entitled "Physical, Chemical and Mechanical Properties of Protein Fibers" before the Protein Fiber Symposium at the 19th annual meeting of the Electron Microscope Society of America, held in Pittsburgh, August 23.

## HOWARD UNIVERSITY

**Stewart R. Cooper**, professor of analytical chemistry, retired last June. Dr. Cooper is teaching half-time during the current year.

**Lloyd N. Ferguson**, professor and Department head, is spending his sabbatical year at the Swiss Federal Institute of Technology as a National Science Foundation faculty fellow in the laboratory of Professor V. Prelog.

**Joseph B. Morris** has been promoted from assistant professor to associate professor.

**Moddie D. Taylor**, professor, has returned from a year's special leave. He was a Robert A. Welch Foundation visiting scholar at Prairie View (Tex.) A&M College during the past academic year. During the summer he served as co-editor of "Teachers Guide for Chemical Study." Dr. Taylor is acting head of the Chemistry Department this year.



## NAS-NRC

**Paul D. Foote**, executive secretary of the NAS-NRC panels advisory to the National Bureau of Standards, was awarded an honorary D.S. degree by Western Reserve University on June 14.

**John S. Coleman** has taken the lead in staff work at NAS-NRC for the Natural Resources Research Study requested last spring by President Kennedy. The study is now concerned with a comprehensive review of the problems and programs of eight major areas, including water, energy, plants and materials, the oceans, minerals, and environment, as well as man's cultural and recreational resources. It is expected to be completed this year. The information and ideas will be assembled in a comprehensive research plan for the consideration of the President. Close liaison is being maintained with the special Panel on Natural Resources of the Federal Council for Science and Technology.

**Frank L. Campbell**, associate editor of this *Journal*, worries about the supply of feature articles for the *Journal* and takes every opportunity, including this news section, to solicit manuscripts. He was also asked to worry about the contents of the *AIBS Bulletin* (American Institute of Biological Sciences) and served as chairman of an ad hoc committee to recommend improvements.

As secretary general of the Pacific Science Congress recently held in Honolulu, **Harold J. Coolidge** was busy for months preparing for the Congress, and finding ways and means to transport participants from the mainland, and from foreign countries, to Hawaii.

**W. H. Larrimer** organized and participated in a Symposium on the Ecological Consequences of the Use of Toxic Chemicals in Pest Control at the Pacific Science Congress.

## NATIONAL BUREAU OF STANDARDS

The following talks have been given by members of the staff:

**F. L. Alt**: "Planning and Management of a Mathematical Research and Service Facility" at the Naval Research Reserve Seminar on Research Planning Management, Princeton University, August 25, and "Some New Developments in Automatic Language Translations" at the Association for Computing Machinery, Los Angeles, September 5-8; **L. M. Branscomb**: "Physics of the Negative Ions" at the Physics Colloquium, University of Washington, Seattle, August 23, and "Radiative Formation and Destruction of Ions" at the Fifth International Conference on Ionization Phenomena in Gases, Sonderpostamt Deutsches Museum, Munich, August 28-September 1; **H. P. Broida**: "Double Wall Glass Dewars for Optical and Other Studies at Liquid Helium Temperatures" at the Fifth International Symposium on Free Radicals, Institute of Physical Chemistry,

Uppsala, July 6-7; **R. D. Elbourn**: "Symbol Manipulation, A New Career for Computers" at the IRE Professional Group on Military Electronics, 5th National Military Electronics Conference, Shoreham Hotel, Washington, June 27; **H.P.R. Frederikse**: "The Properties of Electrons in Rutile" at the Gordon Research Conference on Solid State Studies of Ceramics, Meriden, N. H., July 31-August 4.

Also, **M. Greenspan**: "The Measurement of the Speed of Sound in the Ocean" at NATO, through the University of Pennsylvania, Imperial College, London, August 1; **J. L. Hague**: "Separations in Analysis" at the American Society for Testing Materials, Atlantic City, June 28; **C. M. Herzfeld**: "The Crystal Field Approximation" at the Institut Battelle, Centre de Recherche de Geneve, Carouge-Geneve, Switzerland, July 18; **R. B. Hobbs**: "International Standardization of ISO/TC 6" at the Technical Association of the Pulp and Paper Industry, Queen Elizabeth Hotel, Montreal, Canada, August 17; **A. G. McNish**: "The Science of Precise Measurement" to the Officers of the Naval Weapons Plant, Washington, July 10; **H. L. Logan**: "The Specimen for Use in Investigating the Stress-Corrosion Cracking of Metals at Elevated Temperatures" at the American Society for Testing Materials, Atlantic City, June 28.

Also, **S. B. Newman**: "Microscopy of the Color Phenomena in Polymer Failure" at the General Motors Research Laboratories, General Motors Technical Center, Warren, Mich., July 25; **C. H. Page**: "The Definition and Realization of the Electrical Units" at the National Bureau of Standards, Electronic Calibration Center, Boulder Laboratories, Boulder, Colo., August 21; **A. S. Posner**: "Hydrogen Bonding in Synthetic and Biological Apatites" at the Gordon Conference on Bone and Tooth Structure, Kimball Union Academy, Meriden, N. H.; **I. Rhodes**: "The Teacher's Role in the Age of Automation" at the Summer Institute of the National Science Foundation, College of William and Mary, Williamsburg, Va., July 31; **C. M. Sitterly**: "The Solar Spectrum" at the Department of Physics, University of Wisconsin, Madison, Wis., August 7.

Also, **W. J. Youden**: "Physical Measurements and Experiment Design" at the International Statistical Institute, Paris, September 5, and "Test Programs for the Statistical Evaluation of Materials" at the Centre National de la Recherche Scientifique, Paris, September 6; and **L. B. Leter**: "Temperature Dependence of Electron Emission in the Field Emission Region" before the Eighth Field Emission Symposium, Williams College, Williamstown, Mass., August 28-30.

The following talks were presented before the 18th International Congress of Pure and Applied Chemistry, Montreal, August 7-10: **G. T. Furukawa**: "Calorimetric Determination at the National Bureau of Standards of the Purity of IUPAC-59 Samples of Benzene"; **A. R. Glasgow**,

**Jr.:** "Purification, Controlled Contamination, and Partition of IUPAC Cryometric Benzene Samples"; **W. J. Hamer:** "Theoretical Electromotive Forces for Galvanic Cells Containing Molten Halides"; and **J. R. McNesby:** "Thermal Decomposition and Isomerization of Propyl and Isobutyl Radicals."

**S. N. Alexander** was moderator of the Session on Computer Technology, IRE Professional Group on Military Electronics, Fifth Military Electronics Conference, Washington, June 26-28.

**F. R. Caldwell** was chairman of a panel round table discussion on "Transient Temperature Measurements with Thermocouples in Missile and Space Applications" at the American Society for Testing Materials meeting in Atlantic City, June 29.

**Charles M. Herzfeld** and **W. A. Wildhack** have been appointed associate directors of NBS.

**Floyd Buckley** has been promoted to assistant chief of the Physical Chemistry Division.

**Harry C. Allen, Jr.,** has been appointed chief of the Analytical and Inorganic Chemistry Division.

#### NAVAL RESEARCH LABORATORY

**William A. Zisman,** superintendent of the Chemical Division, received the National Award for 1961 from the American Society of Lubrication Engineers at its annual meeting in Philadelphia last April. This award was in recognition of Dr. Zisman's many contributions to a better understanding of lubrication theory.

At a meeting of an IUPAC committee in Montreal during the first week in August, Dr. Zisman was appointed secretary to the newly established International Commission on Colloid and Surface Chemistry, under the Physical Chemical Section of IUPAC.

**Ronald E. Kagarise,** head of the Spectroscopy Section, presented two papers at the annual symposium on Molecular Structure and Spectroscopy, held at the Ohio State University, Columbus, June 12-16.

**Robert B. Fox,** head of the Organic Synthesis Section, presented a paper before the symposium on Organic Nomenclature in Columbus, Ohio, July 29-31, sponsored by the National Academy of Science and the Air Force in connection with a meeting of the IUPAC Committee on Organic Nomenclature.

A comprehensive group of nine lectures on "Fracturing and Fracture Mechanics" is being given by **G. R. Irwin,** superintendent of the Mechanics Division, at the University of Illinois during 1961. The first three lectures were given in February. The second and third groups are planned for presentation the first week of October and the second week of November.

**G. R. Irwin,** Mechanics Division, and **J. E. Strawley,** Metallurgy Division, attended the meet-

ing of the Deutscher Verband für Materialprüfung, in Würzburg, Germany, on March 16-17, and presented a paper entitled "Progress in the Development of Crack Toughness Tests." They were invited to attend as representatives of ASTM. This was the first large post-World War II meeting of the organization. Nearly 600 members and guests of DVM attended, largely from West Germany, but also from 14 European countries. The theme of the meeting was "Fracture Phenomena and Fracture Testing for Structural Materials."

**J. A. Krafft,** Mechanics Division, will attend a conference on "Crack Propagation" at Cranfield, England, September 26-28. His paper for this conference is entitled "Effect of Dimensions on Fast Instability of Notched Sheets" by **J. M. Krafft,** **A. M. Sullivan,** and **R. W. Boyle.** Dr. Krafft's travel plans include visits to various laboratories in France, Germany, Belgium, and England.

#### USDA, WASHINGTON

**Harold H. Shepard,** chief of the Agricultural Chemicals Staff, Agricultural Stabilization and Conservation Service, served from March 3 to April 28 as research specialist on pesticides at the U. S. pavilion, International Agricultural Exhibition, Cairo, Egypt. In connection with this assignment, Dr. Shepard traveled some 2000 miles in Egypt to view agricultural practices and consult with Egyptian specialists, many of whom have received doctorates at universities in the United States.

On July 27, **Justus C. Ward** gave a talk before the Great Plains Agricultural Council at Bozeman, Mont., on "Problems in the Use of Chemicals." On August 3, he visited the Wildlife Research Laboratory, U. S. Fish & Wildlife Service, Denver, to learn about the pesticide-wildlife hazard evaluation project which is just getting started.

**Hazel K. Stiebeling,** director of the Institute of Home Economics, received the degrees of Doctor of Humane Letters from Bowling Green State University, on June 4, Doctor of Science from Carnegie Institute of Technology on June 13, and Doctor of Science from Drexel Institute of Technology on June 17.

**Elbert L. Little, Jr.,** dendrologist, Forest Service, did field work in Alaska during May and June. He studied the variations and distribution of trees and collected specimens.

**George W. Irving, Jr.,** Agricultural Research Service, spent the week of August 14 at Woods Hole, Mass., as a participant in the NAS-NRC-sponsored conference on Renewable Natural Resources. This meeting was part of a broad program to accumulate the information needed to respond to President Kennedy's request for a comprehensive study on research needed to make optimum use of resources in the decades ahead.

Dr. Irving's topic was "Substitution Crops." He discussed the use of agricultural resources for non-food, non-feed uses—an aspect of resource use that is often overshadowed by the better-known uses for agricultural products in foods and feeds.

**Dorothy Nickerson**, color technologist in the Cotton Division, Agricultural Marketing Service, received the Godlove Award of the Inter-Society Color Council on April 11, in recognition of her outstanding contributions to the knowledge of color in science, art, and industry. Miss Nickerson is the third person to receive the award. The award is a plastic prism in which a gold diffraction grating is embedded.

## UNCLASSIFIED

**Jerome Namias**, chief of the Extended Forecast Section, Weather Bureau, accepted an invitation from the National University of Mexico to serve as a visiting professor at the Institute of Geophysics for two months this summer. He lectured on "Climatic Fluctuations Associated with Problems of Extended and Long-Range Weather Forecasting."

## DEATHS

**Harry A. Bright** died at his home in Chevy Chase, Md., on May 22. He retired last year as chief of the Analytical Chemistry Section of the National Bureau of Standards, after nearly 47 years of service. Mr. Bright was a native of Reading, Pa. He received the bachelor's degree from Pennsylvania State College in 1912 and the master's degree from George Washington University in 1927. He joined the National Bureau of Standards in 1913, and was made chief of the Analytical Chemistry Section in 1936. He was regarded as one of the Nation's foremost authorities on the chemical analysis of metals and alloys, and was awarded a silver medal by the Department of Commerce in 1954 for meritorious service. He also received the American Society for Testing Materials award of merit and the Anachem Award of the Association of Analytical Chemists.

**Gotthold Steiner**, formerly in charge of nematology research in the U. S. Department of Agriculture, died August 21 at the age of 75. He was a native of Switzerland and was educated there, becoming an American citizen in 1927. Mr. Steiner joined the Department of Agriculture in 1921 and retired in 1956. Since retirement he had been living in Puerto Rico, where he was engaged in research at the University of Puerto Rico on tropical nematodes.

## AFFILIATED SOCIETIES

*We have tried to include not only the events scheduled for October, but also such news items as have accumulated since the May issue of the Journal. Most affiliated societies will be resuming regular meetings this month, after a summer of reduced activity.*

### American Institute of Electrical Engineers, Washington Section

May 9—Special meeting for presentation by the authors of papers submitted in the annual competition for awards and certificates.

May 16—Ladies night, the final meeting of the year, featured a talk by Miriam Ottenberg of the *Evening Star* on "Investigative Reporting."

September 11—Special meeting on "Space Communications," with a panel under Edward W. Allen, FCC, as moderator, consisting of the following: John Pierce, Bell Telephone Laboratories; Elmer W. Engstrom, RCA; Herbert Trotter, Jr. General Telephone and Electronics Laboratories; and Richard P. Gifford, General Electric.

### American Society for Metals, Washington Chapter

October 9—A non-technical meeting, the annual "Quench and Draw" party.

### American Society of Civil Engineers, National Capital Section

April 25—Luncheon meeting, at which Bruce G. Davis discussed the role of the Bureau of Reclamation in development of the nation's water resources, the origin of the Bureau, its operation, and current problems.

May 9—Election of officers, and a report by George H. Hickox on a program for increasing emphasis on civil engineering and the work of the Joint Board. Presentation of annual student chapter awards to Donald Evick, GWU; Robert Meyer, Catholic U., and Karl Lewis, Howard U.

May 23—Final luncheon meeting of the year, at which Col. John U. Allen and members of his staff presented an up-to-date summary of the progress and results of the comprehensive Corps of Engineers study of the Potomac Basin.

June 3—Tour of the Southwest Redevelopment Area, conducted by the chief engineer, James E. Linde, including town houses, police and fire stations, apartments, and new market center.

September 12—First dinner meeting of the new season. Capt. Deane E. Carberry, Bureau of Yards and Docks, spoke on "Castles in Spain," the significance today of the eight-year military construction program in Spain.

September 26—Maj. Gen. A. M. Minton described the emphasis placed by the Air Force on the professional status of its civil engineers.

October 10—Regular dinner meeting, Cosmos Club.



October 24—Monthly luncheon meeting, YWCA.

### **American Society of Mechanical Engineers, Washington Section**

April 27—Discussions by Henry E. Frankel on "Down to Earth Space Problems," and by Lawrence M. Kushner on "Imperfections and Mechanical Properties of Single Crystals."

May 11—Chester M. Sinnett, director of product engineering, RCA, spoke on "Creativity in Management."

May 25—Harry George, Martin Company, spoke on "Manufacturing Planning," the relationship of this planning to engineering and product design.

June 1—Symposium on "Fuel Trends and Economic Patterns," covering resources, methods of exploitation, uses and economies, in four areas: coal, Myles E. Robinson, National Coal Association; oil, C. W. Lutz, Gulf Oil Corporation; gas, Curtiss Morris, American Gas Association; nuclear, Andrew W. Kramer, *Atomics Magazine*.

September 28—John de S. Coutinho, Polytechnic Institute of Brooklyn, spoke on "Reliability Control—Fact or Fiction," a consideration of the problem in aero-space equipment.

### **Botanical Society of Washington**

The Society had no formal meetings, but initiated for the first time in a number of years several field trips, one to the Great Falls area, one to Battle Creek Swamp and one to a hemlock preserve area south of Scientists Cliffs.

October 3—First regular meeting of the year.

### **Chemical Society of Washington**

October 12—Three concurrent speakers at 5 p.m., before dinner: "Organo-Derivatives of the Transition Metals," by F. G. A. Stone, Harvard University; "Equilibrium Polymerization and Copolymerization," by Arthur V. Tobolsky, Princeton University; "Non-Covalent Bonds in Protein Structure," by Irving M. Klotz, Northwestern University. Following cocktails and dinner, the speaker of the evening will be Glenn T. Seaborg, chairman of the Atomic Energy Commission, on "The Newest Synthetic Elements," at 8:15 p.m. Catholic University Chemistry Building.

November 9—Panel discussion on "The Chemical Origin of Life" by Philip H. Abelson, Geophysical Laboratory, and Sidney W. Fox, Oceanographic Institute, Florida State University. Walter Reed, 8:15 p.m. Annual election of officers.

### **Columbia Historical Society**

October 19—Regular monthly meeting, at Providence Hospital, where Philip Caulfield, chief of staff, will speak on "A Century of History at Providence."

### **Entomological Society of Washington**

June 7—In cooperation with the Insecticide Society of Washington, the group held a "Space Age" picnic at Log Lodge, Agricultural Research Center, Beltsville.

October 5—Regular meeting, Room 43, Natural History Museum. David C. M. Manson will speak on "Some New Zealand Insects."

### **Geological Society of Washington**

April 26—The 823rd meeting heard papers by K. J. Murata and D. H. Richter on "Basaltic Differentiation as Shown in Recent Kilauea Eruptions"; Irving Friedman on "Trends in Water and Deuterium Content of Pumices from the 1959 Kilauea Eruptions"; and D. Foster Hewett on "Distribution of Manganese."

September 27—At the first meeting of the new season, Isidore Zietz and Kenneth G. Books spoke on "Remanent Magnetism and Aeromagnetic Interpretation of the Bearpaw Mts. Area, Montana"; Paul M. Johnston on "Geology of the Greater Washington Area"; and Bruce R. Doe on "Geothermometry of the Sulfide Ores at Balmat, New York."

### **Helminthological Society of Washington**

May 20—Annual picnic for members, family, and friends.

October 20—51st anniversary meeting, Officers' Club, Walter Reed Army Medical Center. Dinner at 7:00 p.m., after which Leon Rosen, NIH, will speak on "Eosinophilic Meningitis in the Pacific Area," and George Wharton, Ohio State, on "Why Study Systematics?" Reservations are limited to 125 persons.

### **Insecticide Society of Washington**

May 17—"Tropical Fruit Fly Population Sterilization Research in Mexico, Hawaii and the Western Pacific," L. D. Christenson, ARS; and "Comments on Possibilities of Applying the Sterile Male Principle to the Control of Other Insects," by E. F. Knipling, ARS. Annual election of officers, and social hour.

### **Institute of Radio Engineers, Washington Section**

With a membership of 3,500 and some 20 professional groups active, the Section has one of the more comprehensive programs in the Washington area. Beginning with the September issue, there is a new and enlarged publication known as *The Washington Bulletin*, under the editorship of George C. Ruehl. This seems to be one more step in the gradually increasing number of society and chapter journals put out by affiliated societies.

September 11—General section meeting, featuring a panel discussion of "Space Communications," under Edward W. Allen, FCC, details of which are noted in the announcements of the American Institute of Electrical Engineers, above.

September 12, 14, 25—Technical meetings.

September 27—Gala reception and cocktail party, main ballroom, Presidential Arms.

October 16—Regular meeting under the sponsorship of the Professional Group on Engineering Management, concerned with "Stock Analysis."

The following technical meetings will be held in October:

October 2—Instrumentation.

October 4—Electronic Computers.

October 10—Microwave Theory and Techniques.

October 17—Antennas and Propagation; Radio Frequency Interference.

October 18—Nuclear Science.

October 23—Engineering Management.

October 25-26—Conference on Reliability and Quality Control, Department of Interior Auditorium.

October 26-28—Annual technical meeting of the Professional Group on Electron Devices, Sheraton Park Hotel.

### **Medical Society of the District of Columbia**

May 22—The Society, in joint sponsorship with the Metropolitan Washington Board of Trade, presented a testimonial luncheon under the "Health-USA" Awards program to James A. Shannon, director of NIH, and William B. Walsh, founder and president of Project "HOPE." This activity was initiated in 1958 and has become an outstanding recognition of individuals "who have contributed in a statesmanlike fashion to the health needs of our country."

### **Philosophical Society of Washington**

October 13—1512th meeting. Sir Harold Jeffreys will speak on "The Strength of the Earth," at the Powell Auditorium, 8:15 p.m.

### **Society for Experimental Biology and Medicine, District of Columbia Section**

October 5—First meeting of the season, Gorman Auditorium, Georgetown University Medical Center, 38th St. and Reservoir Rd.

### **Society of American Bacteriologists, Washington Branch**

October 24—Regular meeting, including two papers: "Ecology of Rocky Mountain Spotted Fever: Recent Studies," by F. Marilyn Bozeman, Walter Reed Institute of Research; and "Nitrate Reducing Streptococci," by P. P. Williams and C. W. Langston, USDA.

### **Society of American Foresters, Washington Section**

October 19—First meeting of the fall season, YWCA building.

## **THE BROWNSTONE TOWER**



For scientific and social purposes American scientific organizations have evolved along two lines: (1) groups covering natural science as a whole (represented by the American Association for the Advancement of Science and national, state, and municipal academies of science); and

(2) groups concerned with various subdivisions of natural science (represented by national, regional, or local scientific societies). Among the latter are the professional societies, the so-called trade unions of science.

The Washington Academy of Sciences is one of more than 50 state and municipal academies that tries to devise and carry on programs peculiarly suited to its area. These programs differ greatly in different academies, depending not only on local needs but on various historical and human factors. On the whole our state and municipal academies encourage rather than carry on or support research, put much effort into the improvement of scientific education and the identification and development of science talent, provide outlets for the publication of scientific research, and furnish opportunity for scientists in different fields to meet and discuss interdisciplinary problems. Through the activities of their substantive sections they may provide the equivalent of regional or local scientific societies.

Since the officers and board of the Washington Academy are eager to improve its services in kind, quality, and quantity, it should be helpful to us to know what other academies are doing and how they do it. In the April issue of the *Journal* we reported on the California Academy of Sciences. Now I should like to give you the results of my visit of February 3, 1961, to the New York Academy of Sciences at its headquarters, 2 East 63rd St., New York City. For brevity I shall call it "the Academy."

The Academy occupies what was once an elegant four-story town house, which it has outgrown. Upon entering the reception hall my attention was attracted by large plastic numerals over a door. They told the visitor that the membership of the Academy as of that day was 15,222. I next noticed a framed architect's drawing, hanging in a conspicuous place, of a modern 25-story office building. This was captioned "Proposed Science Center Building for the New York Academy of Sciences," which would have its own new nine-story auditorium building attached to the Center Building. Later I was given a descrip-



tive pamphlet on this building project. It is intended, of course, that offices in the larger building will be rented by scientific or science-related organizations and that income from rents will help to pay for the cost of this ambitious project. The site has not yet been purchased, but it is desired to locate the Center within walking distance of the Rockefeller Institute and the New York Hospital—Cornell University Medical School.

The Executive Director of the Academy, Mrs. Eunice Thomas Miner, was not free to see me, so I talked to a young man who was employed in the distribution of the Academy's publications. I wanted to know whether the Academy should be regarded as a municipal academy or a state academy. "Neither," he said, "the Academy is a national organization that happens to be located in New York City." Its 1959 Constitution states that "the center of its activities shall be in the City of New York," implying that there are no geographical limits to its jurisdiction. This is true in practice because more than 75 per cent of the members reside in the 49 states outside of New York and in 66 foreign countries.

Although the Academy is known nationally and internationally for its publication of the proceedings of scientific conferences that it sponsors, it also has a local program of meetings in its own building—monthly meetings of local members of its four sections and 10 divisions. Some of the papers presented at these meetings are published in a monthly periodical called "Transactions of the New York Academy of Sciences." The conference proceedings, or symposia, are published separately as paper-covered monographs, but for purposes of citation are part of a periodical called "Annals of the New York Academy of Sciences," the paging running consecutively through a "volume" of several monographs. There are also a few books called "Special Publications" and a long series of reports beginning in 1919 on the Academy's "Scientific Survey of Porto Rico and the Virgin Islands."

It is obvious that the Academy is primarily an organization for publishing and distributing scientific papers presented at symposia, which it arranges and supports at a nearby hotel, pending the building of its own meeting facilities. It might just as well be the New York office of the American Association for the Advancement of Science specializing in the production and distribution of symposium monographs. No other organization in the United States, not even the AAAS itself, competes with the Academy in its special field of publication.

The ability of the Academy to recruit members at \$25 per person per year and hold them resides in its capacity to give each member the current monographs he wants. If the member is medically oriented, he can easily want several monographs per year, the total list price of

which would exceed \$25. And, in addition, the member receives the monthly program and the *Transactions*. If the member does not get his money's worth, it is his own fault.

The biological and medical sciences predominate in the Academy. Of the 21 monographs scheduled for publication in 1961 all but three of four are in the life sciences. This predominance is reflected in the specialties of the members. For example, I find the following distribution among the members elected in December 1959: M.D.'s 34; other medical scientists 20; other biologists 5; chemists, usually organic, 12; one physicist and a "pedagogue"; total 73. Thus at least 80 per cent of these new members were on the biological side and most of them were either M.D.'s or were working in the medical sciences.

Regarding qualifications for membership, "Persons of scientific training, having been at any time engaged in scientific work or otherwise in the advancement of science, shall be eligible for Active Membership when nominated in writing to the Scientific Council by two members [having] full membership privileges." Recruiting of new members is done systematically by mail.

Like the AAAS, the Academy elevates its genuine scientists to fellowship to which a member is eligible after having been an active member for one year and having "attained outstanding recognition for scientific achievement or for the promotion of science." A Fellow of the Academy is also an Active Member and pays the same dues as an active member. Other classes of membership are: "student," \$5 annually; "sustaining," \$50 annually; "life," \$300; "patron," \$1000; "benefactor," \$5,000. In addition there are corporation members and honorary life members.

The income of the Academy for fiscal year 1959 was almost \$900,000. About \$339,000 came from dues and \$354,000 from sale of publications. Contributions amounted to about \$172,000. Most of this money, about \$480,000, was spent for production and distribution of publications. Approximately \$22,500 was spent for "membership expansion," requiring more than 900 new members to be obtained in 1959 to make the expenditure pay off!

The Academy is governed by a Board of Trustees concerned with finances, budget, and audits, and by a Scientific Council under which operate the following committees: Executive, Conference Organization, Educational Advisory, Fellows and Honorary Life Members, Nominating, Publications and Awards, and Section Activities.

The Academy is structured as follows (two divisions have recently been added):

Section of Biological and Medical Sciences  
Division of Anthropology  
Division of Instrumentation

- Division of Microbiology
- Division of Psychology
- Section of Chemical Sciences
- Division of Biochemistry
- Section of Geological Sciences
- Division of Oceanography and Meteorology
- Section of Physical Sciences
- Division of Engineering
- Division of Nuclear Physics

As I have not attended a local meeting of any of these sections and divisions, I am not able to comment on their programs and connections with science in the metropolitan area. Also I am not informed about the activities of the Educational Advisory Committee, which is expected "to advise and assist accredited educational groups, upon request, on academic problems pertaining to science education, especially at the secondary school level."

What a tremendous difference there is between the New York Academy and the California Academy; the former primarily a medium of communication for medical scientists; the latter primarily an educator of the public in natural history and astronomy through popular publications and exhibits, backed by first-class research. Neither academy bears much resemblance to the Washington Academy; but both teach us not to be exclusive and to do more for our members and the lay public than we are now doing.

—Frank L. Campbell

## ACADEMY ACTIVITIES

### MAY BOARD MEETING

The Board of Managers held its 538th meeting on May 2 at the National Academy of Sciences, with President Abelson presiding. The minutes of the 537th meeting were approved as previously circulated.

Dr. Abelson announced that Joseph M. Caldwell had replaced Douglas E. Parsons as delegate of the American Society of Civil Engineers. He also announced that Raymond J. Seeger was resigning as chairman of the Committee on Science Education, since he expected to spend the next year in advanced studies at Oxford University under an NSF fellowship.

Dr. Frenkiel reported on the Meeting Committee's recent experience in stimulating interest in, and attendance at, the Academy's lecture meetings. He stated that the Committee plans to continue the "third Thursday" regular meetings, generally with speakers from the metropolitan area, and that these would normally be given in the John Wesley Powell Auditorium. The suggestions considered for these meetings were reviews and discussions of fields and disciplines which are currently showing interaction, and perhaps those in which interaction should be generated. A second type of meeting, characterized by the

special meeting recently held at Carnegie Auditorium and addressed by Herman Kahn, Marquis W. Childs, and Frank T. McClure, may be set additionally for once a month; it is anticipated that such meetings would require a larger auditorium than the Powell Auditorium. He said that the Committee had not intended to sort out the meetings by subject matter, to differentiate which would be regular or special meetings. Dr. Frenkiel then discussed the program for the May 18 regular meeting, and ideas for subsequent meetings.

For the Membership Committee, Dr. Robbins presented the names of three nominees for First Reading.

Dr. Robbins also announced the names of Membership Committee Panel chairmen, as follows: Agricultural Sciences, Erwin L. LeClerc (USDA); Chemistry, Howard W. Bond (NCI); Earth Sciences, Victor T. Stringfield (Geological Survey); General Biology, Harold E. Finley (Howard U); Mathematical Sciences, F. Joachim Weyl (ONR); Medical Sciences, Ross C. MacCardle (NIH); and Physics and Astronomy, Richard K. Cook (NBS). She hoped that a panel on engineering sciences could be completed before the fall session.

Dr. Campbell reported that the Policy and Planning Committee had endorsed a letter that the Membership Committee proposed to send to delegates from affiliated societies, concerning stimulation of membership in the Academy (see also under New Business, below). Secondly, he referred to recent Committee discussions concerning the need for another joint directory of the Academy and affiliated societies. Dr. Abelson indicated that at a dinner meeting held some time ago by the Policy and Planning Committee, representatives of the affiliated societies expressed a reasonably positive interest in having a joint directory; but that the major problem was to find someone who was willing and able to take charge of preparing the directory. There was considerable discussion of possible candidates for the job, but no definite conclusions were reached.

Under New Business, the Board considered some draft material distributed by Dr. Robbins for the Membership Committee. This comprised a proposed letter to the delegates of affiliated societies, urging their cooperation in nominating eligible scientists for membership in the Academy; a statement of procedures used by Membership Committee Panels in considering new members for election; and an extract from the Bylaws concerning membership. (Essentially the same material is included elsewhere in this issue of the *Journal*, in the story entitled, "Academy Membership Increase Urged.") After considerable discussion of the distinction between scientific attainment and original research, the Committee's report was unanimously approved.

Dr. Seeger, who had come in late, reported for the Committee on Science Education. He indi-

cated that the Meyer Foundation had withdrawn its financial support of *The Reporter*, monthly publication of the Joint Board. On the happier side, he reported that NSF had provided a \$27,000 grant for extension of the projects that have been carried on for the past two years. He indicated, however, that because of a reduction in the amount from what had been requested, and because of changes brought about by the projects themselves, the time had come to shift the course and objectives of the program. He discussed the shifts in emphasis in some detail.

Following the second reading of their names, the following persons were elected to membership in the Academy: James B. Edson, Roland E. Florin, Harry A. Fowells, Robert E. Hardenburg, Fred R. Kotter, Jacob Mazur, Eugene M. Rankin, Robert L. Schoeneman, Paul A. Siple, and Mary E. Warga.

## JUNE BOARD MEETING

The Board of Managers held its 539th meeting on June 6 at the National Academy of Sciences, with Secretary Specht presiding in the absence of both the president and the president-elect. The minutes of the 538th meeting were approved as previously circulated.

Dr. Specht announced that President Abelson had appointed John K. Taylor to head the Committee on Science Education in view of the resignation of Raymond J. Seeger. Also, Dr. Seeger's place as a member of the Committee has been taken by Churchill Eisenhart, and Robert E. Hobbs has been reappointed; the terms of Drs. Eisenhart and Hobbs will extend through June, 1964. For the Meetings Committee, Dr. Frenkiel spoke briefly regarding the successful meetings of the current season, and pointed out that much of the successful outcome depends upon very active publicity efforts, particularly the mailing of notices to the membership of other societies especially interested in the field. Responding to a comment on conflicts between some of the meeting dates and other society programs, he pointed out that some of the most interesting speakers are busy people whose schedules permit little rearrangement, and some of the meeting dates had to be accommodated to their commitments.

Dr. Frenkiel also discussed program possibilities for the fall meetings of the Academy; one of these may be a follow-up of the recent panel discussion on science fairs. In consequence of the ensuing discussion, Dr. Frenkiel moved that formal action be taken to appoint a committee whose responsibility would be the improvement of the conduct of science fairs in the Washington area; the motion was approved.

For the Membership Committee, Dr. Robbins presented the names of eight nominees for First Reading. Dr. Robbins pointed out that these nominees would not ordinarily become elected until the October meeting, and suggested that,

since the interval between first and second readings is permitted to be only one week, the Board should consider the election of the nominees a week hence (i.e., in the absence of dissident votes received within the following week, the nominees would be considered elected). On motion of Dr. Frenkiel, the Board directed the secretary to cast a unanimous vote for the election of these nominees, subsequent to the determination of tacit approval.

Alfred E. Brown, the Board of Managers' liaison with the Board of Trade of Metropolitan Washington, addressed the Board by invitation on the organization of the Board of Trade's Science Bureau. Among its future activities, the Bureau expects to prepare a brochure listing the science resources of the Washington area. Also, it will undertake a comprehensive study of educational resources in this area, particularly in graduate science education.

For the Policy and Planning Committee, Dr. Campbell reported that the Committee had recommended appointment of an *ad hoc* committee to study the feasibility of preparing a joint directory of the Academy and affiliated societies. If this committee recommends undertaking the task and the Board approves, another committee would be appointed to do the job.

Dr. Campbell also reported that the Committee did not support an application for affiliation from the National Capital Astronomers, a society composed largely of amateurs, on the same basis as that applied to local professional societies. However, the Committee is not ready to make a positive recommendation, which might involve change in structure of the Academy and of its categories of membership.

The Committee has been giving consideration to subjects on which the Academy might take a public position, through meetings or editorials in the *Journal*—i.e., civil defense, administration of the National Zoo, providing for science in the National Cultural Center, the Cooper Bill to police the use of laboratory animals, and scientific intelligence.

In connection with activities of the Committee on Science Education, Mr. Braaten noted that Dr. Schubert had requested a donation of \$200 to support a summer research program for senior high school students. It was pointed out that NSF will match such funds by an equal amount. Dr. Brombacher moved that the request be approved, with the suggestion that the AAAS be asked whether its grant monies, normally credited to the Academy for research support, could be made available for this purpose. The motion was approved.

For the Committee on Encouragement of Science Talent, Dr. Brenner stated that the Junior Academy of Science had issued 500 membership cards. Consideration is being given to changing the nature of the Junior Academy's spring banquet and awards ceremony, so that it

will not be run in competition with a regular lecture meeting of the Senior Academy.

Dr. Foote led a discussion of the Academy's position as concerns support of the National Zoo. Dr. Frenkiel suggested that the topic might be discussed at a fall meeting of the Academy.

Following the second reading of their names, the following persons were elected to membership in the Academy: Abolghassem Ghaffari, Jack C. Smith, and Thomas G. Ward.

Dr. Foote addressed the Board on the organization and functions of the Ohio and Virginia Academies of Science.

## SCIENCE AND DEVELOPMENT

The original "Space Camera" was presented to the Smithsonian Institution by the General Electric Company on February 28. This is the first camera to take motion pictures of the earth from an altitude of more than 300 miles. It was installed in a small data capsule in the nose cone of a U. S. Air Force Thor rocket that was launched from Cape Canaveral, Fla., on May 12, 1959. The rocket travelled 15,000 miles southeast over the Atlantic Missile Range in 15 minutes. The capsule was ejected near the predicted impact point and recovered from the sea by a recovery ship. The camera had to be structurally designed to protect the exposed film during re-entry into the earth's atmosphere, deceleration, water impact, and flotation. A significant result of this test flight was proof that ordinary photographic emulsions can be used in unshielded cameras at altitudes of 300 miles without deterioration from radiation, even though the Van Allen belt extends down to about 200 miles in the latitude where the test took place.

A revised text of the International Temperature Scale of 1948 was adopted by the 11th General Conference on Weights and Measures at the October 1960 meeting of the General Conference. This temperature scale was originally adopted in 1927. It defined 6 fixed points and formulas establishing the relationship between temperature and the indications instruments calibrated by means of the fixed points. The fixed points were the oxygen point ( $-182.97^{\circ}\text{C}$ ), the ice point ( $0.000^{\circ}\text{C}$ ), the steam point ( $100.000^{\circ}\text{C}$ ), the sulfur point ( $444.6^{\circ}\text{C}$ ), and the freezing points of silver ( $960.5^{\circ}\text{C}$ ) and gold ( $1063^{\circ}\text{C}$ ). Because of new experimental data the Scale was revised in 1948. The recent revision was prepared by the National Bureau of Standards in cooperation with other members of the Advisory Committee on Thermometry. In this revision the easily-reproduced triple point of water ( $0.01^{\circ}\text{C}$ ) replaced the ice point as a fixed point on the scale. Also, the name was changed to International Practical Temperature Scale.

A collection of birds that may include forms new to science has been made in the

area around the headwaters of the Rio Seteganti and the high mountain Cerro Pirre in Darien, Panama, near the Colombian border. The expedition was conducted by Alexander Wetmore, retired secretary of the Smithsonian Institution, under the auspices of the Gorgas Memorial Laboratory of Panama City. The party was flown in by helicopters and landed on hard ground near the edge of swamps. The area is a dense jungle that had been abandoned by humans since the closing of a gold mine there about 50 years ago. According to Dr. Wetmore, bird life in that part of Darien resembles the South American avifauna more than the Central American.

New agricultural weather services will soon be provided in eight broad areas of the United States through a \$758,000 appropriation to the Weather Bureau. The new program will provide frequent and timely agricultural forecasts by means of a teletypewriter circuit covering each area. Local radio and television stations, as well as farm publications and newspapers, will be connected to the forecast office by the network. The forecasts will enable farmers to determine the best times for planting, spraying, harvesting, and other vital operations. Besides three daily special agricultural weather forecasts and a daily "Farm Weather Summary," the teleprinter hookup will also give rapid dissemination of fire-weather forecasts and agricultural interpretations of the 5-day and 30-day weather outlooks, along with other information of value to agricultural interests.

Progress toward agreement on the use of a compromise system for transliterating Russian (Cyrillic) characters into the Latin alphabet was achieved at a meeting of representatives of scientific and engineering societies, editors, publishers, librarians, and Government agencies held here on July 14. The meeting was called by AAAS at the request of NSF, to discuss the adoption of a single, uniform transliteration system for Russian to English. The compromise system, tentatively designated the "AAAS transliteration system," combines features of various systems now in use so that transliteration of Cyrillic to Latin alphabets may be standardized. An important consideration in adoption of the compromise system was that it could be typewritten with the minimum use of diacritical marks. Systems considered in effecting the compromise were the Board of Geographic Names (BCN) System, the British Standards Institution (BSI) System, the Library of Congress-American Library Association (LC-ALA) System, and the International Standardization Organization (ISO) System.

The Library of Congress has initiated a survey of the scientific and technical serial publications of the world. Purpose of the survey, under the direction of C. M. Gottschalk, is the compilation of a bibliography of sources on scientific and



technical serials and, based on those sources, a calculation of the number of current periodicals of the world by country and by subject. At the conclusion of the survey, financed by an NSF grant, a report will be published, along with an international bibliography of sources consulted.

The first known underwater analyses of the sea's naturally-occurring radioactive sources have been made by the Navy with a new ultra-sensitive radiation measuring device recently tested a mile deep under the Caribbean Sea. Called DUNC (Deep Underwater Nuclear Counting) the device is so sensitive that it can detect one atom of radium in a billion billion molecules of water. It was designed by the Nuclear Physics Division of the Naval Ordnance Laboratory, to collect detailed data on the presence and intensity of under-sea radiation sources in their natural habitat. Especially adapted for shipboard operation, DUNC instantaneously renders data formerly obtainable only by collecting samples of the sea and subjecting them to analysis in a laboratory.

A gamma irradiation facility will be designed for radiation research studies on the University of Maryland campus. The heart of the new project will be a cylinder, one foot high and three inches in diameter, which will contain 3,000 curies of cobalt 60. Gamma radiation from this source will be equivalent to about seven pounds of radium. Targets to be irradiated will be placed in a shielded room located below ground level. The source will then be lowered into the room to expose the targets. Upon withdrawal of the source into its 5,000 pound lead shield, the targets will be removed and analyzed.

On June 14, Commerce Secretary Luther H. Hodges broke ground for the new National Bureau of Standards laboratories at Gaithersburg, Md. The ceremony signaled the initial construction phase for a 20-building, \$104 million research facility which will permit complete relocation of the Bureau from its present location on Connecticut Avenue to the 555-acre site in Montgomery County.



## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

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Anthropological Society of Washington	REGINA FLANNERY HERZFELD
Biological Society of Washington	HERBERT FRIEDMANN
Chemical Society of Washington	JOHN L. TORGESEN
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American Meteorological Society	JACK THOMPSON
Insecticide Society of Washington	MILTON S. SCHECHTER
Acoustical Society of America	RICHARD K. COOK
American Nuclear Society	URNER LIDDEL

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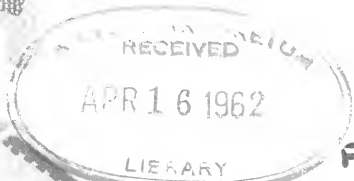
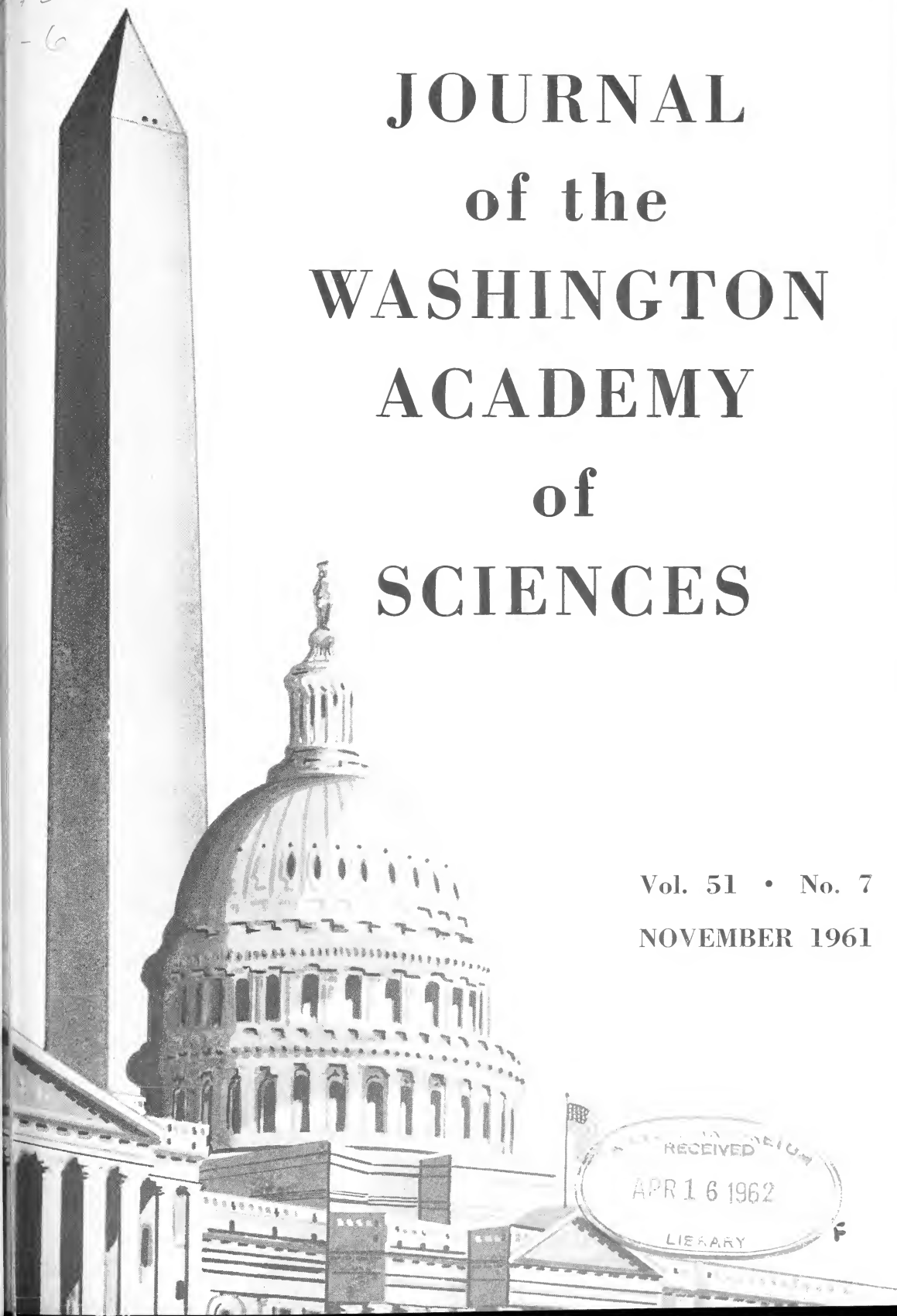
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RICHARD P. FARROW, National Canners Association

## Contributors

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ELLIOTT B. ROBERTS, Coast & Geodetic Survey  
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# Chemicals to Sterilize Insects

**Arthur W. Lindquist**

*Entomology Research Division, Agricultural Research Service, USDA*

Since earliest recorded times, man has sought to protect himself against insects attacking his person, his crops, and his livestock. He has tried flails, brush brooms, swatters, nets, traps, and chemicals. Always his intent was to destroy the pests quickly. During the last 30 years, emphasis has been placed on quick kill by means of insecticides. The agriculturist, householder, and layman have stressed the need for quick knockdown and kill of insect pests. But now a change in thinking has occurred among entomologists and others regarding the control of insects.

The newest idea is to interfere with the reproduction potential of insects and thus reduce their ability to develop in large and damaging numbers. That an insect is rendered sexually sterile does not mean that it will die immediately. The pest will live for a normal length of time but will be incapable of reproduction. Individual and area control will be possible, but results may be slower than with direct kill by insecticides.

## **Gamma Irradiation**

Control of screw-worms by gamma radiation, which makes the males sterile, has had wide publicity. This method consists essentially of rearing and releasing sexually sterile males in numbers greater than exist in a natural population until control or eradication of the natural population results. If adequate numbers of sterile insects are released, their very preponderance gives them an advantage in competing with the normal males for the females existing in the natural population. Reports of laboratory and field investigations dealing with the sterile-male method have been re-

corded by Bushland (1951-1953), Lindquist (1955), and Knippling (1955). These reports constitute some of the most interesting entomological reading of the past two decades. Proof of the soundness of the gamma-radiation sterile-male method was provided by the eradication of the screw-worm from the 170-square-mile Island of Curacao (Baumhover 1955). The remarkable feat of eliminating this pest from Florida and the Southeastern States in 1958 is an outstanding achievement. In this program 3-1/4 billion reared, sterile flies were released systematically over approximately 85,000 square miles for a 17-month period. This entirely new method of insect control has resulted in an annual saving to the livestock industry estimated at about \$20 million.

## **Chemosterilants**

As an extension of the gamma-induced sterility concept, research was initiated at our Orlando, Fla., laboratory three years ago to develop chemosterilants that would induce insect sterility. Such a method presents an intriguing and exciting area for research. What if certain of these chemicals could be used instead of radiation for sterilizing large numbers of insects? Their use might turn out to be an important advance, particularly if the chemicals would cost less or be more practical than gamma radiation and produce a sterile but more vigorous insect. But most importantly, could insects within a natural population somehow be exposed to such chemicals, and sterility effects achieved, without the necessity of rearing and releasing vast numbers of treated insects? It seems clear that a population in a closed or isolated



system could be greatly reduced or even eliminated if a high enough percentage of the native insects were systematically and continuously exposed to a sterilizing chemical.

A chemical sterilizing both males and females would prevent reproduction among those actually sterilized and thus inhibit reproduction to the same extent as would an insecticide that kills directly. If, for example, 90 percent of the females contacted the sterilant, reproduction would immediately cease in those individuals. If 90 percent of the males also contacted the sterilant, these would be available to compete with nonsterile males in mating with untreated females. There should be a preponderance of these sterilized males over the remaining untreated 10 percent of the population or newly emerged specimens. These numerically superior sterile males would thus reduce the population further and provide a bonus effect over the conventional method of direct kill by insecticides. In this way, a chemosterilant should provide a potential 99 percent control of reproduction instead of the 90 percent expected from an insecticide. Knipling (1959) has calculated the theoretical population decline of insect and other animal populations subjected to a treatment which causes sterility versus one that produced direct kill. It should be pointed out, however, that the sterility effects must not significantly change sexual vigor or competitiveness of the treated males. A type of sterility which destroys sexual behavior or other habits would have no advantage over direct destruction of the organism.

### **Possibilities for Use of Chemosterilants**

Since some of the experimental sterilizing chemicals are effective as residual treatments on surfaces, it might be possible to use them safely on farm buildings or other places where insects rest or congregate. Their application might be feasible on vegetation in or near swampy areas

where horse flies, deer flies, and biting gnats breed or congregate.

A residual treatment of resting places such as sheds, buildings, and tree holes might provide control of disease-carrying mosquitoes. The females exposed to the treatment would lay infertile eggs and the males exposed would render sterile some of the females not so exposed, thus further contributing to a population decline. Complete elimination of a disease-carrying species may not be necessary since it is well known that malaria, for instance, can be controlled by the residual treatment of buildings where the anopheline vector rests. This treatment destroys only a fraction of the population, but is sufficient to break the transmission cycle of the disease. However, a sterility-producing treatment would be expected to be slower in preventing vector transmission since the sterile insects might still be capable of transmitting the disease. However, if a sterilizing agent could also be made to act directly on the disease organism in the insect, control of the disease might be produced more rapidly.

Chemosterilants might be used along with a bait or lure. The attractant would draw the insects to a central point and exposure to the chemosterilant would be by contact with the residue or by oral ingestion of treated food. Insecticides have proved highly effective, for example, when incorporated in a bait for fly control (Gahan *et al.* 1953). Substitution of a chemosterilant for an insecticide might thus offer a means of producing sterility in a high percentage of the natural population of this insect.

A potentially useful scheme might be to combine an insecticide and a chemosterilant (Lindquist 1961). A combination of both types of chemical could be used in a bait, as a residual treatment of vegetation or buildings, or as a space spray in restricted situations. This plan might at first seem contradictory. What advantage can there be in killing insects that have been made

sterile? However, it must be realized that insecticide treatments seldom kill all the insects coming in contact with the material. Some individuals of any population have a natural tolerance to insecticides. Furthermore, most insect populations have developed varying degrees of physiological resistance to insecticides and some of the insects escape death even though exposed. The advantage of a combined chemosterilant and insecticide treatment is that the insecticide would kill the weaker forms and make the resistant surviving females incapable of reproduction. Surviving males would act as a further deterrent to population increase by mating with newly emerged or other nonsterile females that have escaped treatment. The insecticide in a combined treatment would provide some immediate control, whereas the sterilant would have a more complete and lasting effect in reducing the insect population.

A combined treatment might be an effective way of preventing insect resistance to insecticides. Of course, there is the possibility that insects might develop physiological resistance to the chemosterilants. Insecticide-induced resistance is a result of selection of individuals more capable of withstanding the effects of these materials, or with an innate capacity to develop effective physiological systems to rapidly metabolize insecticides and subsequently transmit such characteristics to their progeny. It does not seem likely that chemosterilants would induce such physiological resistance, since the factor of selection of stronger individuals by killing the weaker does not seem to apply. Furthermore, chemosterilants act on the reproductive system without mortality, which would appear to eliminate the process of selection. However, resistance to any chemical cannot be ruled out. Behavioristic resistance such as avoidance of the chemosterilant could perhaps develop in a manner similar to that reported by Schmidt and LaBrecque (1959), who found that house flies avoided malathion-treated baits.

## Recent Research

For several years, it has been known that certain chemicals prevent ovarian development and affect reproduction in *Drosophila* (Goldsmith *et al.* 1952) and in house flies (Mitlin *et al.* 1957). It thus seemed plausible that safe chemicals could be found to sterilize both male and female insects. About three years ago a screening program to find such chemicals was initiated at our Orlando, Fla., laboratory. The house fly was the principal test insect, although two species of mosquitoes were also tested with the materials showing some activity on the house fly.

As was expected, screening of chemicals to find those possessing sterilizing properties was time-consuming and laborious. Chemicals that kill can be detected in a day or two, but testing of chemosterilants involves treating the insect, mating treated and untreated specimens, and determining hatchability of eggs. These steps take approximately 30 days for the evaluation of only one chemical. To date, several hundred such compounds have been given a preliminary screening.

Amethopterin (LaBrecque 1960) was one of the first chemicals showing promise. A single feeding of 0.5 percent in sugar bait prevented female house flies from ovipositing but had no effect on the males.

In 1960, a few compounds were found that seemed to have exceptional promise in sterilizing both male and female house flies, mosquitoes, and stable flies. LaBrecque (1961) reported on three ethylenimine compounds known as alkylating agents, and which are commonly referred to as radiomimetic compounds. The coined common names of these materials, together with their chemical names, are as follows: A p h o x i d e (tris(1-aziridinyl) phosphine oxide), aphomide (*N,N'*-ethylenbis[*P,P*-bis-(1-aziridinyl)-*N*-methylphosphinic amide]), and apholate (2,2,4,4,6,6-hexa(1-aziridinyl)-2,4,6-triphospha-1,3,5-triazine).

These compounds, fed to adults at concentrations of 0.5 to 1.0 percent in the

food, caused sterility of both sexes. The flies must feed on treated food within three days after emergence in order to become sterile. Females given treated food and mated with normal males produced only a few eggs, and these did not hatch. Matings of treated males with normal females resulted in almost normal egg production, but none of the eggs hatched. In small-cage tests, treated flies competed satisfactorily with normal flies. In large-room tests, flies given untreated food produced 40,000 pupae, whereas flies given a choice of treated and untreated food produced 13 to 121 pupae. These results are highly encouraging and suggest that chemosterilants have a reasonable chance of providing practical control.

Recent research at Orlando showed that both sexes of *Aedes aegypti* (Linn.) and *Anopheles quadrimaculatus* Say were sterilized by incorporating aphoxide or apholate in the adult food or placing it in the larval water medium. Aphoxide has been especially promising as a residual treatment of resting surfaces.

In tests with apholate on the stable fly (*Stomoxys calcitrans* (Linn.)), it was found that a 48-hour exposure to a residual film applied on glass at a rate of 10 mg. per square foot caused nearly 100 percent reduction in hatch of eggs from treated females mated to treated males. Of particular interest was the fact that apholate was nearly as effective 12 weeks after treatment as at one week, thus showing long-lasting residual effect. Topical applications of aphoxide at a rate of 3.7 mg. per fly was slightly more effective on males than on females.

### Effect of Chemosterilants on Vigor

Insects exposed to gamma radiation usually are not as long-lived as unexposed insects, and somatic damage tends to make treated insects less vigorous and competitive than the normal insects. Such a radiation effect is a serious obstacle to the possible use of gamma-irradiated insects for controlling certain mosquitoes, the boll

weevil, the gypsy moth, and no doubt other species. Although the screw-worm does not seem to be injured to any great extent by radiation, there is reason to believe that the efficiency of treated males released in nature is reduced. Competitive and vigorous seekers of native females are required to achieve full effect of sterile insects in control or eradication. If chemosterilants can be developed which produce sterile males that are stronger, longer-lived, and more active seekers and thus more competitive than those treated with radiation, a great step forward would be taken in the utilization of the sterile-male technique, involving the rearing and release of sterile insects.

Unpublished research by G. C. Labrecque, D. W. Meifert, and Carroll N. Smith at Orlando with house flies in cages, comparing radiation and the administration of apholate, indicates that the chemosterilant is more efficient in producing competitive males than gamma-ray treatment. Some males were given 1 percent apholate in the adult food for three days after emergence. Others were exposed to 2500r in the pupal stage and introduced into cages at a ratio of four sterile males to one normal male and one normal female (4:1:1). The hatch of all eggs laid by females was reduced 77 percent by irradiated males and 82 percent by the chemosterilized males. The theoretical reduction of viable eggs by either method with this ratio is 80 percent. The actual 82 percent reduction of hatch caused by the chemosterilized males is very little less than the 83 percent theoretical reduction by use of five sterile males to one each of normal males and females (5:1:1). It appears therefore that the chemosterilized males are much more efficient. In a rearing and release experiment, four chemosterilized males would in theory be able to effect as much control (82 percent) as five chemosterilized males (83 percent)—ratios of 4:1:1 as compared with 5:1:1.

In other laboratory-mating tests at Orlando, it was shown that apholate-treated

male house flies at ratios of 3, 5, and 10 times the normal males and females resulted in average reductions of viable eggs of 97, 100, and 100 percent respectively. These results are even more significant than those given in the preceding paragraph. The theoretical reductions of viable eggs at these ratios are 75, 83, and 91 percent respectively. Thus it appears that the chemosterilization induces much greater than normal efficacy. If these observations are borne out in practical use, they could have an enormous bearing on control efforts.

It should be emphasized, however, that these experiments measured only the viability of eggs resulting from the mating of sterile males with normal females. It is possible that behavior patterns other than mating efficiency could be affected by either treatment. Under field conditions, competitiveness and vigor may be different from that in laboratory cages.

Preliminary competition tests in cages with *Aedes aegypti* indicate that apholate-treated males are considerably more effective, that is, cause greater reductions of viable eggs and are longer-lived than irradiated males. The experiments indicated that the chemically sterilized males were more competitive with normal males in mating with normal females.

### Problems and Hazards

Experimental field work to determine how to use these chemicals, and later practical use of chemosterilants by individuals or control agencies, pose several problems. One of the first needs is to determine where, when, and how to apply these materials so as to take full advantage of their properties. With nearly any insect species, much detailed information needs to be known about feeding, resting, mating, emergence, and flight habits so as to apply the chemosterilant correctly and at the right time. For example, the preferred resting places of mosquitoes in nature must be known for residual treatment of those

areas. Most mosquitoes and numerous other insects rest on vegetation near the water or site from which they emerge, and dosages must be adjusted to take care of the length of time particular species rest thereon. With the chemosterilants now being explored, the greatest efficiency will result if the insects ingest or contact the chemical very soon after emergence.

The use of chemosterilants against the natural population to achieve insect control or eradication has not reached the practical state. There are many unanswered problems that need investigation and resolution. The problem of previously mated insects migrating into the treated area may nullify results in a small area. Will such normal insects invade a treated area in sufficient numbers to prevent adequate control? With some insects, community use of chemosterilants on a wide basis may be necessary. With others, migration may not be of a magnitude sufficient to reduce control. Will a delay in obtaining control of bloodsucking forms or plant feeders by the use of chemosterilants alone be accepted by the public? Can efficient ways be found of minimizing destruction of crop pests during the time required for sterile insects to reduce the population? Such objections might be overcome by using conventional killing agents to reduce the population to noneconomic levels and then relying on chemosterilants for greater efficiency in preventing population increase. Much field experimentation with any given species of insect will be required to answer the many questions on the efficacy and practicability of chemosterilants in controlling insects.

It is obvious, therefore, that detailed information on biology and habits is an important prerequisite for effective use of these chemosterilants. More than ever before, entomologists need to work toward a fuller knowledge of insect habits. An immense amount of research is also required to devise ways to test and use chemosterilants so as to obtain practical control or eradication results.



Another important factor may be the effect of chemosterilants on beneficial insects, such as efficient parasites and predators. If an effective compound is found for use against a destructive species, and it also destroys the native parasites and predators because of the way it is used, methods must be devised to apply the chemical so it will not harm or, at least do minimum damage to, the beneficial forms.

Both domestic and wild animals, fish, birds, and other animal life, including man, must be considered in studying the use of chemosterilants. One hopeful sign is that some of the candidate sterilants now being investigated seem to have an almost specific effectiveness against species or groups of species. Perhaps materials specific against certain forms or groups can be found or synthesized, and thus provide a safeguard against sterilizing effects on beneficial organisms. The opportunities for developing chemosterilants specific in action against insects, with little hazard to higher animals, should be as good as developing insecticides specific in action against insects and nontoxic to higher animals.

In summary, therefore, it appears that the application of chemosterilants for insect control has considerable promise. These compounds might be used in lieu of radiation to produce vigorous competitive males for release; and they offer great potentialities for use against the natural population, thus obviating the necessity for release of enormous numbers of sterile specimens such as was done in the highly successful eradication program of the screw-worm in the Southeastern States.

The recent discovery that certain chemicals will sterilize both males and females of house flies, mosquitoes, and stable flies by contact or ingestion provides exciting possibilities for research and control. Such materials, provided they are safe to use, offer greater possibilities than killing agents. Combining insecticides and chemosterilants in one treatment may be a way to obtain immediate and longer-lasting

control than with insecticides alone. The insecticide will act quickly on the weaker individuals, and the chemosterilant will make surviving strong individuals incapable of reproduction. This method may be an effective approach to combating insecticide resistance. It does not appear likely that resistance to chemosterilants will develop as quickly as when insecticides are used alone.

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# WAS Elections Procedures

**Heinz Specht**

*Secretary, Washington Academy of Sciences*

Election of the officers of the Washington Academy of Sciences is carried out annually according to time-encrusted procedures which have not been changed in any major way for many years, certainly not since 1937. It is probable, however, that most members of the Academy have only a hazy notion of how election actually occurs, and it may well be that even some of the Academy officers will find something of which they were not aware in the following commentary on this process.

In order to fully understand the implications of certain parts of the procedure, it should be pointed out that the Board of Managers of the Academy is defined in the Bylaws as follows:

## **Article V—Board of Managers**

*Section 1.* The activities of the Academy shall be guided by the Board of Managers, consisting of the President, the President-elect, one Delegate from each of the affiliated societies, the Secretary, the Treasurer, six elected Managers-at-large, the Editor, the Managing Editor, the Archivist, and the Custodian of Publications. The elected officers of the Academy shall hold like offices on the Board of Managers.

*Section 2.* One Delegate shall be selected by each affiliated society (see Art. VIII, Sec. 3). He shall serve until replaced by his society. Each Delegate is expected to participate in the meetings of the Board of Managers and vote on behalf of his society.

*Section 5.* The Board shall have power to fill vacancies in its own membership

until the next annual election. This does not apply to the offices of President and Treasurer (see Art. IV, Sec. 5), nor to Delegates (see Art. V, Sec. 2).

It is apparent that the Academy, which is composed of an elected membership from whom six Managers-at-large are elected, and a body of 26 affiliated societies, each of which is privileged to send a Delegate, is thus governed by a dual representation. It should be pointed out, also, that the Academy membership is a dues-paying one and also committed to the policies of the Academy through a vote, while the affiliates, as such, are privileged only in the following manner:

## **Article VIII—Cooperation**

*Section 2.* . . . provided, it (the Academy) shall not have power to incur for, or in the name of, one or more of these societies any expense or liability not previously authorized by said society or societies . . .

The common bond between the affiliates and the Academy is, of course, the common membership; but it is apparent that those affiliates with few Academy members on their rosters have a proportionately greater representation on the Board than those with many Academy members.

To turn now to the matter of election of officers, the following is the serial list of admonitions and procedures prescribed in the Bylaws:

## **Article IV—Officers**

*Section 11.* No one shall be eligible to hold elective office until one year after election to membership.

*Section 12.* Prior to November 1 of each year the Nominating Committee, having been notified by the Secretary, shall meet and nominate by preferential ballot, in the manner prescribed by the Board of Managers, one person for each of the offices of President-elect, of Secretary and of Treasurer, and four persons for the two Managers-at-large whose terms expire each year. It shall, at the same time and in like manner, make nominations to fill any vacancy in the foregoing. Not later than November 15, the Secretary shall forward to each Academy member a printed notice of these nominations, with a list of incumbents. Independent nominations may be made in writing by any ten active members. In order to be considered, such nominations must be received by the Secretary before December 1.

*Section 13.* Not later than December 15, the Secretary shall prepare and mail ballots to members. Independent nominations shall be included on the ballot, and the names of the nominees shall be arranged in alphabetical order. When more than two candidates are nominated for the same office the voting shall be by

preferential ballot in the manner prescribed by the Board of Managers. The ballot shall contain also a notice to the effect that votes not received by the Secretary before the first Thursday of January, and votes of members whose dues are in arrears for one year, will not be counted. The Committee of Tellers shall count the votes and report the results at the annual meeting of the Academy.

*Section 14.* The newly elected officers shall take office at the close of the annual meeting, the President-elect of the previous year automatically becoming President.

The reader will now have become aware of the fact that not only is it highly desirable that Academy members, who are members of affiliate societies, take an active part in instructing the Delegate from each such society with regard to his actions on the Nominating Committee, but also that every effort should be made to nominate to Academy membership those eligible in the affiliated societies in order to get to a thoroughgoing representation and true reciprocal benefits to both the Academy and its affiliates.

## New WAS—Affiliate Directory Planned

**Robert W. Krauss**

*University of Maryland*

For some time, the Academy's Board of Managers has been aware of the desirability of having a directory of scientists resident in the Washington area. In this connection, a committee was recently appointed by President Abelson to investigate the feasibility of preparing such a register, which would include all members

of the Academy as well as members of its affiliated societies.

The membership of the committee is as follows:

Edmund M. Buras, Harris Research Laboratories  
Charlotte C. Campbell, Walter Reed Army Institute of Research

Lowell E. Campbell, Agricultural Research Service  
J. Reid Clement, Naval Research Laboratory  
Ashley B. Gurney, National Museum  
Robert W. Krauss (chairman), University of Maryland

The committee is fortunate to have as its consultants James I. Hambleton, Archibald T. McPherson, Waldo L. Schmitt, and Bourdon F. Scribner, all of whom have had prior experience with the preparation of directories.

In any venture such as this, success will depend on the active support of the members and officers of the affiliated societies. Accordingly, the committee has written to

each affiliate, asking whether the society is willing to have its membership included in the directory, and whether the society is willing to give financial support to the directory. It is to be hoped that the result of this survey will be a vote of confidence in the project.

The value of a cross-indexed directory with current addresses, specialties, and affiliations of the splendid assemblage of scientists in the Washington area should be obvious. Not only will this directory serve the members well; but also it should serve as an introduction for many Government agencies and private corporations to the strength and skills of the scientists of the Washington area.

## Board Recommends Dues Increase

An increase in dues from \$6 to \$10 for resident members, and from \$5 to \$7.50 for non-resident members of the Washington Academy of Sciences, was advocated in a report of the Policy and Planning Committee to the Board of Managers at the October 3 meeting of the latter. The Board voted unanimously to recommend the increase to the membership of the Academy, which will be asked to vote on the question in December.

The chairman of the Policy and Planning Committee, supported by the treasurer of the Academy, pointed out that expenses for 1961 will exceed income, and that the secretary and treasurer should have clerical assistance in 1962. The increase, if voted by the members, will stop deficit spending, which occurred also in 1959 and 1960, and will provide for payment of some clerical help.

## Joint Board Sponsors Student Research Program

**Leo Schubert**

*Chairman, Department of Chemistry, American University*

During the summers of 1960 and 1961 the Joint Board on Science Education and cooperating groups conducted an interesting experiment in science motivation and experience for secondary school students. This involved the placement of gifted

students in scientific laboratories of the Washington area, for an eight-week period of training in research methods. The students received no financial compensation except for a contribution toward their expenses for carfare and lunches.

The experiment had a modest beginning with 15 students in 1960, when it was financed wholly by local scientific societies. It was expanded to 36 students in 1961, and was financed largely from funds supplied by the National Science Foundation, with ancillary support by the local societies. It is expected that the program will be continued in the summer of 1962, on an even larger scale.

The writer served as director of the program and chairman of the Research Participation Committee of the Joint Board. Other members of the Committee were Louise Marshall (NIH), Keith Johnson (Washington Public Schools), Ira Hansen (GWU), John Leonard (NRL), Theodore Litovitz (CU), and Stephan Schot (AU). Assisting the Committee as *ex-officio* members were the following science supervisors of local school systems: Phoebe Knipling (Arlington), Charles Davis (Fairfax), and Edmund Burke (Montgomery). Other science supervisors of the area were invited to participate, but were unable to accept. All those associated with the Committee served without compensation.

The program was fortunate to secure the services of Margaret H. Maury, science teacher at Sidwell Friends School. Mrs. Maury acted as associate director of the program: she assumed the important obligation of visiting the laboratories at which the students worked, and serving as liaison between the students, their scientist-supervisors, and the director.

In addition to \$2,500 provided by NSF, funds were contributed by the following: Joint Board (\$790), Washington Junior Academy of Sciences (\$500), Washington Academy of Sciences (\$300), Chemical Society of Washington (\$300), and the Montgomery County Board of Education (\$200).

The program was advertised at virtually no cost. The mimeographed announcements were distributed through normal channels by the school systems themselves, without any postage involved. There were 170 qualified applicants representing 63 schools

in the area. Invitations were sent to 38 students: only two students responded negatively. The distribution of the students was as follows: Montgomery (9), Prince Georges (9), Washington (8), Arlington and Alexandria (3), Catholic (3), private (2); two students were from outside the area. In all, 24 schools were represented.

The program was centered at American University. The University provided facilities for a series of orientation lectures at the beginning, and a series of meetings at the end when the students reported in seminar fashion what they had accomplished during the summer. The secretarial and administrative functions were housed at the University.

The unique feature of the experiment was that cooperation was obtained from research organizations in the area. In this way, the science education potential of the local research organizations was utilized: this area has more scientists per unit of population than any other geographical area in the country.

In the cooperating laboratories, the students were able to engage in genuine research under competent scientists. The point of view was that they were apprentices, and that they had a great deal to learn: no effort was made to treat them as geniuses who had already mastered much of science. It was deemed important to expose them to research and to productive scientists so as to assist in motivating them toward science as a way of life.

The cooperating laboratories were most generous with their assistance; they offered twice as many openings as there were students to fill them. The laboratories and the numbers of students they assumed were: American University Chemistry Department (4), U. S. Department of Agriculture, Beltsville (8), Walter Reed Army Institute of Research (6), George Washington University Surgical Research Laboratory (1), Resources Research, Inc. (1), Goddard Space Flight Center (3), Melpar, Inc. (3), National Bureau of Standards (2), National Institutes of Health (7), and



Georgetown University Observatory (1). The personnel officers and research administrators in these laboratories rendered indispensable assistance in explaining the program to the scientists in advance, in planning with the scientists for student assignments, and in facilitating visits by the associate director of the program.

The students were expected to keep regular working hours, identical with those of their supervisors. They were given \$10 weekly for eight weeks to assist in paying for carfare and lunches, so that this experience would not prove to be a financial burden. They were expected to behave as junior research assistants, and it was obligatory upon them to keep a research record book; this served later to provide material for the concluding seminars. The range of research subjects varied widely and reflected many of the research interests of the cooperating laboratories. As the students' skills and understandings increased, the scientists enlarged their responsibilities: toward the end of the program, many of the students were able to work out ideas of their own.

A serious preliminary effort has been made to evaluate the success of the program: an ultimate evaluation, of course,

will require years and can be established only in terms of what happens to the students. The personnel officers of the cooperating laboratories were most helpful in this evaluation. The students as well as the scientists were requested to evaluate the program in as objective a manner as possible. Without exception, all the students believed the program to be excellent. They not only learned new skills, but also were much impressed with the discipline of science and the way in which knowledge leads to more knowledge. Of the supervisors, only three felt that their charges were anything less than excellent; and even these three scientists commended the program. A common statement was that "the boy is a real find" or that "the program was stimulating." The only negative criticism was that the program was not sufficiently large.

The papers relating to this program, including all the evaluation material, are on file in the writer's office, and are available for inspection. A very limited number of copies of a report on the program also are available. It might be noted that the writer has suggested sponsorship of this program to a national organization, so that comparable programs may be set up elsewhere.

## WAS Holds Inter-academy Education Conference

**John K. Taylor**

*Chairman, Committee on Science Education*

A regional inter-academy conference on science education, sponsored by the Washington Academy of Sciences, was held on September 30 at the Executive House. The conference was part of a program conducted under a grant from the National Science Foundation.

The conference had the objective of informing neighboring academies of each

others' programs, and to explore avenues of cooperation. It was attended by 41 persons, including two from the Maryland Academy of Sciences, three from the Pennsylvania Academy of Science, six from the Virginia Academy of Science, four from the West Virginia Academy of Science, and one from the Ohio Academy of Science. The grant provided travel expenses for out-of-



town visitors, as well as the cost of a luncheon and incidental expenses.

The morning session was devoted to reports from the academies describing their science education programs. The afternoon discussion centered on ways to improve individual programs.

In reporting the activities of the Maryland Academy of Sciences, Nigel O'C. Wolff, executive director, pointed out that it was not a professional organization, but rather that membership was open to all persons interested in science. The Academy operates a museum and a planetarium, and conducts an annual course in basic astronomy. It annually sponsors a series of popular science lectures that provide a source of income to carry on the Academy's programs.

A unique feature of its program is the preparation and circulation of self-contained exhibits on all phases of science to state high schools. Last year 763 deliveries were made to various schools. The Academy also sponsors the National Science Talent Search in the State, and recognizes state-winners in this program.

Eight full-time employees are involved in these activities, for which there is an annual budget of \$70,000, exclusive of an NSF grant.

John G. Barker of Radford College and William W. Scott of VPI reported on Virginia Academy activities, largely concerned with a Junior Academy comprising 100 local chapters, with a total membership of about 3,000.

A series of regional science days are held annually at five locations—the University of Virginia, William and Mary, VPI, the University of Richmond, and Virginia State College. Student papers are presented at each, and the best are selected for presentation at the annual meeting of the State academy. A Junior Academy *Bulletin* is also sponsored and published three times a year.

The Academy is also interested in teacher preparation, and has appointed a Committee on Science Teaching to study

how the Academy may cooperate with others interested in raising the standards for teaching certificates in Virginia.

K. B. Hoover, secretary of the Pennsylvania Academy of Science, reported on their activities. He was assisted by Oren S. Kaltreiter, teacher at Middletown High School, and by Albert Eiss of the Pennsylvania Department of Education. Their activities are closely associated with the junior academy program and with the Talent Search. The junior academy holds an annual meeting at which the best papers receive small monetary awards and also are published in the proceedings of the senior academy. The Pennsylvania Academy is also cooperating with the State Department of Education on matters concerned with teaching standards.

A three-part program was described by John C. Wright of the West Virginia Academy of Science. One program is a series of Saturday morning seminars for high-school students. Their visiting scientists program, now in its second year, has enlisted 25 college teachers who will visit some 100 high schools this year. An interesting activity is concerned with a faculty exchange among 17 colleges. Each college sends one faculty member to teach for one week at another institution. Room and board for the visiting instructor are furnished by the college. A National Science Foundation grant provides travel and administrative expenses and a small honorarium.

The Ohio Academy of Science operates an extensive visiting scientist program which was described by W. A. Manuel, its director. Currently, 160 scientists have been enlisted to visit a high school for a one-day period. The scientist speaks to classes and assemblies, and confers with the high school faculty. Requests for such visits have been received from 235 schools throughout the State. An NSF grant makes this program possible.

The Washington Academy program was described in detail by John K. Taylor, director of projects for the Joint Board on

Science Education. This program, consisting of a visiting scientist and engineer project, conferences on science education, sponsoring of experimental courses at elementary and secondary school level, sponsoring science fairs, a teacher awards program, and publication of *The Reporter*, is well known to most Washington Academy members.

Abner Brenner commented briefly on the local junior academy program, and B. D. VanEvera, president-elect of the Academy, described the program which provides research grants-in-aid to high school students and teachers.

The afternoon session was devoted largely to discussion of problems concerned with the administration of the various programs. Insufficient funds was a major handicap to the success of most activities. Lack of permanent staff and turnover in volunteer help is a weakening factor. This could, of course, be obviated by regular and sufficient income devoted to educational activities. The NSF grants to academies have been a real stimulus to improving local educational programs.

In closing, the conference voted unanimously that the Washington Academy request funds from the NSF to sponsor a similar inter-academy conference during 1962.

## THE BROWNSTONE TOWER



Anyone who has held any office in a scientific society, either by election or by appointment, is inclined to feel that members do not support it by their dues as well as he thinks they should. This is under-

standable because the conscientious office holder, who wants nothing for himself, does want to be identified with a progres-

sive, effective organization. Feeling as he does that he has given his allegiance to an important, or potentially important society, he finds it hard to understand why many of its members seem so indifferent to it, and so reluctant to increase dues upon which the service of the society to its members and to others depends.

So far as the Washington Academy of Sciences is concerned, I think I do understand the zeal of the office holder and the indifference of the uncommitted members, and can make allowances for both. Consequently, in the following reflections on dues to the Academy, I shall not write as if my readers were obstinate delinquents, but to those who for good reasons of their own do not give the Academy a high priority among their many interests. Dispassionately, I should like to argue for the improvement of its priority to be manifested later, I hope, by the approval of the members who will vote on the dues increase recently recommended by the Board of Managers. (See story elsewhere in this issue.)

The fact that the Academy has not had an increase in dues during the period in which the cost of living has doubled, is not by itself a strong argument for such increase. It is a powerful reason only if the members want the Academy to play an important role in this metropolitan area. Do they really want it, or are they interested only in the prestige of membership? And what prestige attaches to an organization too poor to do anything of which its members may be proud?

The members can, I think, be proud of the Academy as it is now, but without additional financial support I can foresee only a decline in its effectiveness; certainly no improvement will be possible. At present a few members are giving an excessive amount of time to the Academy, and are encroaching upon the time of their employers. It will become increasingly difficult to find members who will jeopardize their family life and official

employment for the Academy. The secretary, treasurer, editor, and perhaps other officers need competent help for which we should be able to pay—not full-time help necessarily, but enough to relieve them of routine bookkeeping and correspondence. The Academy also needs an executive officer—someone who can supervise the Academy's office work and see that the policies of the Academy are carried out. The executive officer should be a member of the Academy in retirement, who could derive much satisfaction from such service and who should receive an honorarium, although he might wish to serve without compensation. It is important to find someone who is able, willing, and free to think about the Academy every day, not only as an office manager but as one who can see opportunities for the Academy to be of service, and can suggest ways and means to the officers. Our sister Academy of Maryland (practically of Baltimore) has had such services from Thomson King for several years. Surely we in Washington can find an equally able and devoted executive officer.

To please, we hope, the majority of the members, the *Journal* of the Academy has ceased to be an outlet for the publication of primary research, mostly descriptive. It has taken the more difficult road requiring the organized cooperation of contributors and solicitation of manuscripts, and is becoming a journal of scientific news, opinion, and exposition, all intended to reflect the scientific activities of this area. It has a long, long way to go before its coverage can be regarded as adequate, and it is susceptible to improvement in quantity, quality, and variety. Because the *Journal* is intended to be of local interest, it is probable that non-member subscriptions (from libraries) and non-resident membership will decline almost to zero before the *Journal* becomes important enough in its new role to attract national and international attention. That means temporary loss of revenue. Increase in dues will overcome this loss and, we hope, pro-

vide a margin for improvement of the *Journal*.

If your altruism and pride tell you that the Academy is worth supporting, there are at least two actions you can take without being appointed to a committee by President Abelson: you can vote for the recommended increase in dues when you receive the ballot by mail in December, and you can propose at least one person for membership in the Academy.

—Frank L. Campbell

## Achievement Award Nominations Requested

The WAS Committee on Awards for Scientific Achievement has announced that nominations for the Academy's annual scientific achievement awards are currently being solicited.

Each year the Academy gives awards for outstanding achievement in five areas—biological sciences, engineering sciences, physical sciences, mathematics, and teaching of science. Award winners are honored at the Academy's annual dinner meeting in January.

All members of the Academy are invited to submit nominations, which must be received by the Committee on or before November 13 in order to receive consideration. Nominations must be prepared in accordance with established procedures, which can be learned from the general chairman of the Committee or from any of the panel chairmen, as listed below:

General chairman: Norman Bekkedahl,  
NBS (EM 2-4040, Ext. 7070)

Biological sciences: Harold A. Rehder,  
National Museum (NA 8-1810)

Engineering sciences: Freeman K. Hill,  
APL (JU 9-7100)

Physical sciences: Malcolm C. Henderson,  
CU (LA 9-6000)

Mathematics: Harry Polachek, D. T.  
Model Basin (EM 5-2600, Ext. 377)

Teaching of science: John K. Taylor,  
NBS (EM 2-4040, Ext. 7855)

# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors are assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, U. S. Department of Agriculture, Agricultural Marketing Service, Room 2628 South Building, Washington 25, D. C.*

## APPLIED PHYSICS LABORATORY

**Ralph E. Gibson**, APL director, addressed the Second Research Reserve Seminar on Research Planning and Management on September 2 at Princeton University. His talk was entitled, "A Systems Approach to Research Management."

**Albert M. Stone** was a member of an advisory panel which evaluated the Summer Institute for High School Teachers on September 8 and 9.

## Membership Forms Available

The Membership Committee is appealing to all WAS members to recommend eligible colleagues for membership in the Academy.

Criteria for membership are discussed in the October *Journal*, page 93.

Nomination forms may be obtained from the Committee chairman, Mary Louise Robbins, in the Department of Microbiology, GWU Medical School, 1339 H St., NW, Washington 5 (FE 3-9000, Ext. 510 or 554).

## CATHOLIC UNIVERSITY OF AMERICA

**W. Gardiner Lynn**, professor of biology and head of Department, participated in the Third International Symposium on Comparative Endocrinology at Oiso, Japan, June 5 to 11. While in Japan he visited the Universities of Tokyo and the Marine Biological Laboratory of the University of Tokyo, at Misaki. En route, he visited the University of Hawaii. He received a travel grant from the National Institutes of Health.

Dr. Lynn attended the American Institute of Biological Sciences meetings at Purdue University in August. During the meetings he represented the American Society of Zoologists at a meeting of the governing board of AIBS, and attended a meeting of the Executive Committee of the American Society of Zoologists.

**William R. Osgood**, professor of civil engineering, attended a six-week Summer Institute on the Properties of Engineering at Iowa State University. The Institute is designed to provide experience for improving instruction in engineering materials science. It was administered by Iowa State University for the National Science Foundation and the American Society for Engineering Education.

**Frank A. Biberstein**, professor of civil engineering, attended the 64th Annual Meeting of the American Society for Testing Materials, held in Atlantic City, June 28-29, as a member of its Committee on Manufactured Masonry Units and as chairman of the Editorial Subcommittee. He is also a member of the Council of the recently organized Division of Materials Sciences of ASTM.

## COAST AND GEODETIC SURVEY

**Elliott B. Roberts**, assistant director for research and development, was appointed chairman of the Committee on Geomagnetism and Aeronomy at the PAIGH meeting in Buenos Aires, Argentina, August 1-15.

**Lansing G. Simmons**, chief mathematician in the Geodesy Division, has been appointed chairman of the AGU Committee for the Study of the Metric System in the U.S., and also chairman of the Board of Civil Service Examiners for the Coast and Geodetic Survey.

**Dean S. Carder** submitted a paper, "Sub-Pacific Structure as Inferred from Seismic Waves Generated by Nuclear Explosions in the Central Pacific," which was presented at the Tenth Pacific Science Congress in Honolulu.



## HARRIS RESEARCH LABORATORIES

**Alfred E. Brown** presented a paper entitled "Research Planning Around People" at the Military Research and Development Conference at Fort Belvoir on September 26. Dr. Brown has been appointed chairman of the R & D Research Management Round Table for the 1961-62 term.

**Arnold M. Sookne** has been appointed Section Editor for Textiles for *Chemical Abstracts*. This post was held for many years by Milton Harris of this laboratory. Mr. Sookne was chairman of a session on "Chemical Finishing of Cotton" at the Fall Meeting of the Fiber Society, held at West Point, N.Y., on October 11-13.

## NAS-NRC

**Norwood B. Gove** of the Nuclear Data Project attended the nuclear physics section of the International School of Physics, held by the Italian Society of Physics during August at Varenna, on Lake Como.

**Katharine Way** attended the Rutherford Jubilee International Conference in Manchester, England, the first week in September.

**Agda Artna** and **Margaret Waggoner** are new staff members on the Nuclear Data Project. The latter will spend half time on the staff of the University of Maryland, as associate professor, during the school year.

## NATIONAL INSTITUTES OF HEALTH

**Chester W. Emmons**, senior mycologist, left on October 2 for Japan and Indonesia, to deliver a series of lectures and participate in collaborative research. Dr. Emmons will lecture on erythrococcosis to the Japanese Society for Medical Mycology at Sendai, and then lecture in Osaka and other cities. In Indonesia, he collaborated in research on phymycoses and other systemic mycoses at the laboratory of Dr. Lie-Kin-Joe in Djakarta.

## NATIONAL BUREAU OF STANDARDS

**Dean B. Judd** received the Gold Medal of the Illuminating Engineering Society on September 25, for distinguished contributions "that have conspicuously furthered the art, knowledge, and profession of illuminating engineering." The medal was awarded during the opening session of the IES National Technical Conference in St. Louis. Selection of Dr. Judd, outstanding authority on color, as IES medalist for 1961, is symbolic of the importance of color in illuminating engineering. As United States representative on the colorimetry committee of the International Commission on Illumination (CIE) since 1931, Dr. Judd has won international esteem. He has been chairman of CIE's committee of experts E-13.1 (Colorimetry) since its establishment in 1955.

## AFFILIATED SOCIETIES

### Acoustical Society of America, Washington Chapter

The new season opened on October 16 with a talk by Aubrey W. Pryce, ONR, on "Current Status of Underwater Acoustics."

### American Institute of Electrical Engineers, Washington Section

At the October 10 general meeting, C. W. Schilling, director of the AIBS Biological Sciences Communication Project, spoke on "Radiation Hazards—Everybody's Business."

### American Society of Civil Engineers, National Capital Section

Neal Fitz Simons, research engineer with OCDM, spoke at the October 10 dinner meeting on "Design for Protection from Effects of Nuclear Weapons," dealing with recent developments on the engineering and economic aspects of shelter design.

A former Section member, Archie N. Carter, now of Minneapolis, addressed the October 24 luncheon on the effect of major projects such as the St. Lawrence seaway, the AEC program, and the Interstate Highway system on engineering and construction at the state and local levels.

The most recent Section bulletin devotes considerable attention to a "Policies Plan for the Year 2000," just published by the National Capital Planning Commission and the Regional Planning Council. At that time, the population is expected to reach 5 million, and there is much that needs to be done if we are not to have an impossibly inefficient and unattractive urban sprawl.

### American Society of Mechanical Engineers, Washington Section

A symposium on "Fuel Cell Potential for Oil and Gas Power," sponsored by the Oil and Gas Power Division of the Section, was held October 12.

### Botanical Society of Washington

At the 475th meeting, October 3, Russell B. Stevens, George Washington University, addressed his remarks to the question, "Is Plant Pathology a Fake?"

### Chemical Society of Washington

At the October 12 meeting at Catholic University, three concurrent before-dinner sessions featured the following talks: "Some Aspects of the Organic Chemistry of the Transition Metals," by F. G. A. Stone of Harvard University; "Equilibrium Polymerization and Copolymerization," by A. V. Tobolsky of Princeton University; and "Non-covalent Bonds in Protein Structure," by Irving M. Klotz of Northwestern University. Following a dinner attended by over 250 persons, Glenn T. Seaborg, chairman of the Atomic Energy Commission, spoke on "The Newest Synthetic Elements."



## Geological Society of Washington

Three speakers constituted the program on October 11, as follows: M. Gordon Wolman, Johns Hopkins, "Downstream Effects of Dams on Alluvial Channels"; Charles Milton, USGS, "Progress in Green River Mineralogy"; and Howard T. Evans, USGS, "Studies on Hydrolysis Reactions in Solution at the Royal Institute of Technology at Stockholm, Sweden."

## Insecticide Society of Washington

A program on current large-scale insect control activities was presented on October 18. Four talks were presented by USDA scientists: "Current Forest Pest Control Work," by W. V. Benedict, Forest Service; "Eradication of an Exotic Tick," by W. G. Bruce, Animal Disease Eradication Division; "Research Designed toward the Ultimate Eradication of the Boll Weevil," by C. F. Rainwater, Cotton Insects Research Branch; and "Federal Control Programs Involving Gipsy Moth, Pink Bollworm, Fire Ant, and Golden Nematode," by D. R. Shepherd, Plant Pest Control Division.

## Institute of Radio Engineers, Washington Section

The general meeting of the Section on October 16 heard Thomas W. Folger, a senior security analyst specializing in investments in the electronics industry, speak on "Electronics and Investments."

Some awareness of the scope and diversity of the technical meetings within the section is available from a calendar of meetings for October in the new "Washington Bulletin." The list, omitting speakers, reads as follows: "FM and PM Interference Cancellation Techniques;" "Relative Microwave Absorption Cross Section of Mankind;" "Problems in Making Spectrum Signature Measurements;" "Fabric Antennas and their Application;" "Status of Controlled Thermonuclear Fusion Research;" "Techniques of Bandwidth Compression for Telemetry;" and two conferences—one an annual broadcasting symposium, and the other on reliability requirements for semiconductor device specifications.

## Medical Society of the District of Columbia

The October bulletin of the Society, as usual, schedules almost daily events of interest and importance to medical specialists in the area. One cannot but be impressed with the value of this listing to those concerned with human health problems.

## Society for Experimental Biology and Medicine, District of Columbia Section

Three papers, on diverse topics, appeared on the October 5 program: "Lettuce Seeds, Aphids, Cockle-burs, Petunias, and Rabbits—Photoperiodism and Growth," by A. A. Piringer, USDA; "Preparation and Properties of n-Hydroxethyl

Derivatives of Adenosine, Adenosine Triphosphate, and Nicotinamide-adenine Dinucleotides (DPN)," by H. G. Windmueller and Nathan O. Kaplan, NIH; and "Chemistry of Inflammation," by John C. Houck, Children's Hospital.

## CALENDAR OF EVENTS

Events which will take place, so far as we can determine at the time of writing, are noted below. Where no indication of the program other than date appears, it will in most instances be a regularly scheduled meeting of the society. Last-minute changes in time and place, or emergency cancellations, cannot be reflected here.

### November 7—Botanical Society of Washington

Hugh D. Sisler, University of Maryland, will speak on some effects of fungicides on cell metabolism.

Powell Auditorium, 8:00 p.m.

### November 8—Geological Society of Washington

Powell Auditorium, 8:00 p.m.

### November 9—Chemical Society of Washington

Panel discussion on "The Chemical Origin of Life," by Philip H. Abelson, director of the Geophysical Laboratory, and Sidney W. Fox, Florida State University. Annual election of officers.

Walter Reed Institute of Research, 8:15 p.m.

### November 9—American Society of Mechanical Engineers, Washington Section

PEPCO Auditorium, 10th and E Sts., N.W., 8:00 p.m.

### November 10—Philosophical Society of Washington

Powell Auditorium, 8:15 p.m.

### November 13—American Society for Metals, Washington Chapter

Students' night; discussion of "Development of High Strength Nickel Steel" by C. C. Clark, International Nickel Co.

AAUW Bldg., 2401 Virginia Ave., N.W. Dinner 6:30; technical sessions, 8:00 p.m.

### November 13—Institute of Radio Engineers

Natural History Museum, 8:00 p.m.

### November 13—International Association for Dental Research, Washington Section

"Thermal Expansion of Dental Materials—Clinical Significance, Apparatus, and Results Obtained with an Automatic Interferometer," by George Dickson, NBS; and "Dentistry Around the World," by Albert Russell, NIH.

Materials Testing Laboratory, NBS, 8:00 p.m.

### November 14—American Institute of Electrical Engineers, Washington Section

PEPCO Auditorium, 10th and E Sts., N.W., 8:00 p.m.

### November 14—American Society of Civil Engineers, National Capital Section

Rep. Robert F. Ellsworth (Kansas), will

speak on "An Engineer's Role in Politics."

Powell Auditorium. Dinner 6:00; program 8:00 p.m.

**November 15—Insecticide Society of Washington**

Symons Hall, University of Maryland, 8:00 p.m.

**November 15—Washington Society of Engineers**

Powell Auditorium, 8:00 p.m.

**November 16—Society of American Foresters, Washington Section**

YWCA, 17th and K Sts., N.W. Dinner meeting at 6:30 p.m.

**November 20—Acoustical Society of America, Washington, D.C. Chapter**

National Bureau of Standards, 8:00 p.m.

**November 20—Society of American Military Engineers, Washington Post**

YWCA, 17th and K Sts., N.W. Luncheon at 12:00 noon.

**November 28—American Society of Civil Engineers, National Capital Section**

Maj. Gen. James B. Campert will speak on "Civil Engineering in Missile and Space Programs."

Luncheon meeting, YWCA, 17th and K Sts., N.W., 12:00 noon.

**November 28—Society of American Bacteriologists, Washington Branch**

C. W. Emmons, NIH, speaking on "Environmental Sources of Mycotic Infections."

Walter Reed Medical Center, 8:00 pm.

**November 29—Geological Society of Washington**

Powell Auditorium, 8:00 p.m.

## JOINT BOARD

Howard A. Meyerhoff, executive director of the Scientific Manpower Commission, is the newly-installed chairman of the Joint Board on Science Education. Serving with him are Robert B. Hobbs of the National Bureau of Standards, vice-chairman; Ralph I. Cole of Melpar, Inc., secretary; and Joseph E. Guidry of the Bureau of Reclamation, treasurer.

The annual directory of the Joint Board is now off the press, and is available for distribution to science departments of local secondary schools as well as to persons interested in science education activities. It contains names and addresses of school contact persons, personnel of various Joint Board committees, and related information. An appendix contains information on a number of supporting activities.

Copies of this 32-page booklet are regularly distributed to the heads of the science and mathematics departments of area schools by the school contact persons. A limited number are available to others on request to the Joint Board office, as long as the supply lasts.

A summary report describing the activities sponsored by the Joint Board under a grant from the National Science Foundation, is now available for distribution. It contains a summary of the Visiting Scientists and Engineers program, accounts of the proceedings of the various conferences held throughout the year, and reports from the several schools cooperating in the experimental mathematics-science coordination project.

Copies of this booklet will be sent free on request to the Joint Board office at 1530 P St., N.W.

John K. Taylor, past chairman of the Joint Board and editor of *The Reporter*, attended the Shell Conference for Science Supervisors held at Cornell University last August, to speak on "Washington Scientists Assist Local Teachers." From the trend of the discussion following the talk, it was evident that many were perhaps a little envious of the fine cooperation existing here between teachers and scientists.

The conference was attended by supervisors from throughout the country. Others present from the Washington area were Phoebe Knipling and Mrs. Tempe Franklin of Arlington, and Charles Davis of Fairfax.

## JUNIOR ACADEMY

Specially-conducted trips to New York are being sponsored again this fall by the Washington Junior Academy of Sciences. The schedule called for trips to be taken on October 21 and 28, November 4 and 18, and December 9. Departures from Washington are customarily at 8:05 a.m., with return at 10:15 p.m. of the same day.

The all-expense tours cost \$16.50 per person. This price includes round trip transportation in reserved coaches; milk for lunch (students carry lunch); special subway train to the American Museum of Natural History and the Hayden Planetarium, as well as entrance fees to these buildings; motor coach sightseeing tour of New York City; and a complete hot dinner in a New York restaurant. One teacher or chaperone is provided for each 20 students.

The tours are restricted to members of the Junior Academy, members of science clubs, and their friends. Participants are limited to the capacity of the trains.

## SCIENCE AND DEVELOPMENT

A special seminar on transportation engineering, sponsored by the International Cooperation Administration, was held August 17 and 18. Eight professors from the University of Belgrade attended the seminar, which was organized by ICA to assist them in planning the establishment of a school of transportation

in Yugoslavia. The visitors returned to the University for three weeks in September, and will return again for two weeks in November.

**The phenacridiniums, a new family of quaternary ammonium compounds, were very effective against downy mildew of lima beans in laboratory and greenhouse test conducted at Beltsville by B. C. Smale and WAS member J. W. Mitchell.** The compounds were synthesized and studied for clinical use against bacteria and fungi affecting man, but have not been adopted for medical use because of the indelible yellow stain they cause. However, the stain caused at the concentrations used for plant disease control is not objectionable. Further research will be needed before these compounds are recommended.

**Maryland mineral deposits are shown on a map** recently released by the Geological Survey. Locations of more than 500 mines, quarries, and pits in which minerals of commercial value have been found are shown. The map (Mineral Investigations Map MR 12) was compiled from published sources, field observations, and information in the files of the Geological Survey.

**A new world-wide network of earthquake recording stations** will improve detection of earthquakes and monitoring of earth vibrations. The network will span six continents and will be instrumented by the Coast and Geodetic Survey. The information gathered will provide data on the nature, location, and frequency of world earthquakes that might ultimately lead to prediction of destructive shocks.

**The cornerstone of the Smithsonian's Museum of History and Technology** was laid Friday, May 19. Chief Justice Earl Warren, chancellor of the Board of Regents of the Institution, and Senator Clinton P. Anderson, a regent and chairman of the Joint Congressional Committee, presided at the ceremonies. The new museum will have five floors and a basement. National collections relating to American history (civil, political, and cultural); the history of science, engineering, and manufacturing; and the history of our Armed Forces will be exhibited

on three of the floors. The other floors will contain study collections, laboratories, shops for preparing exhibits, a cafeteria, and service facilities. The building will be completed in the summer of 1962.

**A center for the collection and evaluation of data on atomic transition probabilities and cross sections** has been established at the National Bureau of Standards. It will compile atomic data in areas where experimental or theoretical investigations are being conducted at NBS. This is part of a research program sponsored by the Office of Naval Research and the Advanced Research Projects Agency, to supply data needed for current and future research in plasma physics and astrophysics.

**Chemists at the Naval Ordnance Laboratory predict that lightweight fiberglass rocket motor chambers, reinforced with non-woven glass fibers (roving), are destined soon to become standard equipment for space vehicles.** These chambers may cost only a fourth as much, and be up to three times as strong on a weight basis, as the metal chambers presently in use. This prediction is based on results from a new device, "NOL Hydraulic Ring Tensile Tester," developed under the NOL program to evaluate parallel glass fiber as reinforcement for plastic pressure vessels, of which rocket motor chambers are a prime example. Test hoops are fabricated by drawing glass strands through a resin bath onto a circular mold under controlled conditions of temperature, tension, and angle of wind. Tests indicate that application of a chemical finish to glass fibers is one of the important factors in improving the tensile strength of a glass reinforced plastic. Plastics reinforced in this manner offer a means of controlling the directional strength of a structural item to a degree not possible with woven or random mat fiberglass. Also, parallel glass fibers theoretically can be packed to occupy over 90 percent of the volume in a reinforced plastic. This is important, since the strength properties of a reinforced plastic are directly proportional to the plastic glass content.



## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington .....	LAWSON M. MCKENZIE
Anthropological Society of Washington .....	REGINA FLANNERY HERZFELD
Biological Society of Washington .....	HERBERT FRIEDMANN
Chemical Society of Washington .....	JOHN L. TORGESEN
Entomological Society of Washington .....	WILLIAM E. BICKLEY
National Geographic Society .....	ALEXANDER WETMORE
Geological Society of Washington .....	MARGARET D. FOSTER
Medical Society of the District of Columbia .....	FREDERICK O. COE
Columbia Historical Society .....	U. S. GRANT, III
Botanical Society of Washington .....	HAROLD T. COOK
Society of American Foresters .....	G. FLIPPO GRAVATT
Washington Society of Engineers .....	HOWARD S. RAPPLEYE
American Institute of Electrical Engineers .....	WILLIAM A. GEYGER
American Society of Mechanical Engineers .....	WILLIAM G. ALLEN
Helminthological Society of Washington .....	DOYS A. SHORB
Society of American Bacteriologists .....	MARY LOUISE ROBBINS
Institute of Radio Engineers .....	ROBERT D. HUNTOON
American Society of Civil Engineers .....	JOSEPH M. CALDWELL
Society for Experimental Biology and Medicine .....	KATHRYN KNOWLTON
American Society for Metals .....	JOHN A. BENNETT
International Association for Dental Research .....	GERHARD BRAUER
Institute of the Aerospace Sciences .....	FRANCOIS N. FRENKIEL
American Meteorological Society .....	JACK THOMPSON
Insecticide Society of Washington .....	MILTON S. SCHECHTER
Acoustical Society of America .....	RICHARD K. COOK
American Nuclear Society .....	URNER LIDDEL

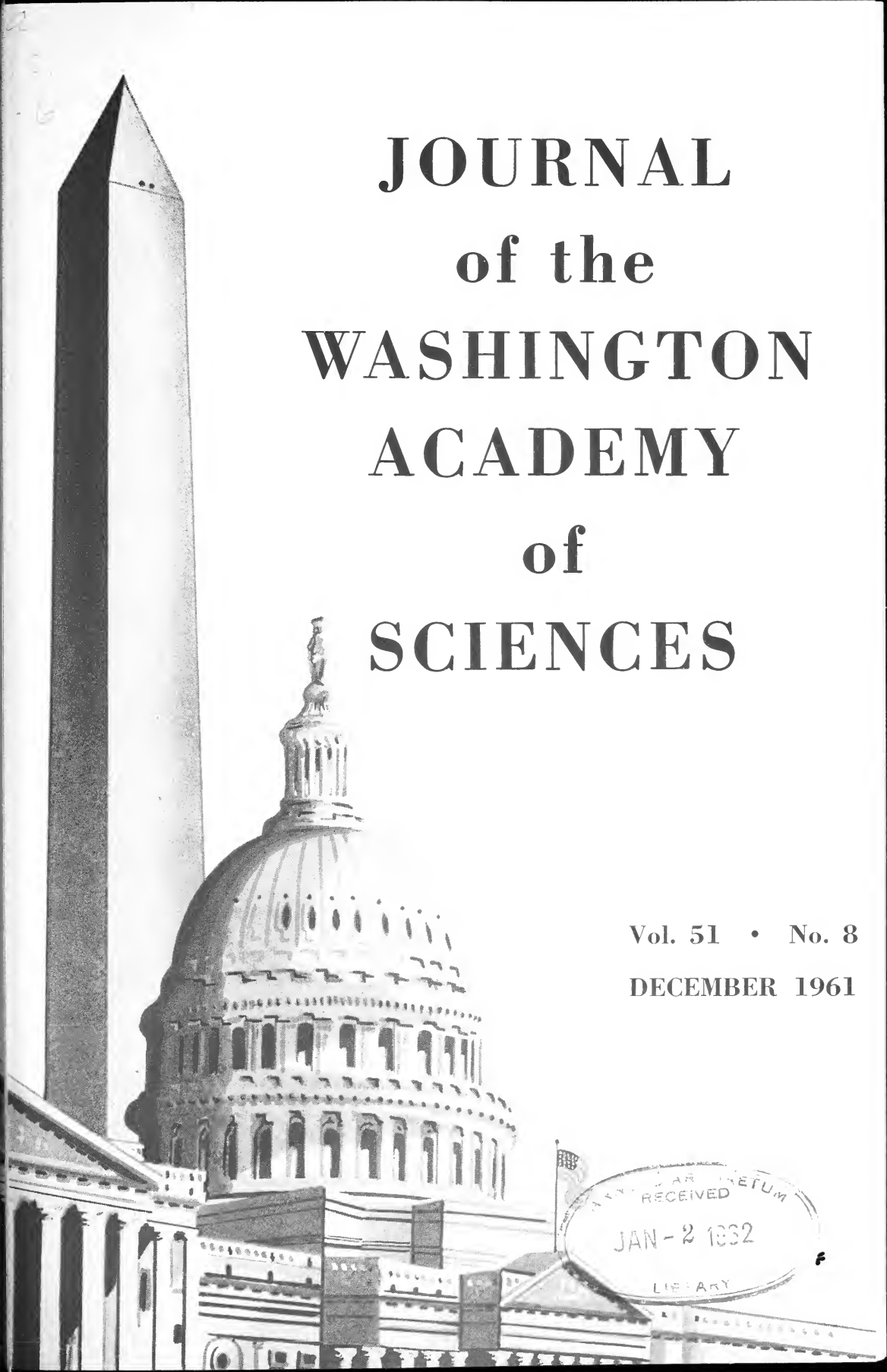


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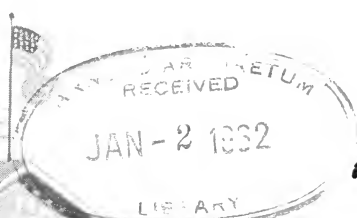
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A black and white illustration of the Washington Monument and the U.S. Capitol dome. The Washington Monument is a tall, slender obelisk on the left side of the image. The U.S. Capitol dome is a large, rounded structure with a statue on top, located in the center and right. The building's facade with columns is visible at the bottom.

# **JOURNAL of the WASHINGTON ACADEMY of SCIENCES**

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# JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES

Editor: SAMUEL B. DETWILER, JR., Department of Agriculture

## Associate Editors

FRANK L. CAMPBELL, National Academy of Sciences  
HAROLD T. COOK, Department of Agriculture  
RUSSELL B. STEVENS, George Washington University  
JOHN K. TAYLOR, National Bureau of Standards  
LAWRENCE A. WOOD, National Bureau of Standards

## Staff Assistant

RICHARD P. FARROW, National Canners Association

## Contributors

ALBERT M. STONE, Applied Physics Laboratory  
JOHN A. O'BRIEN, JR., Catholic University  
ELLIOTT B. ROBERTS, Coast & Geodetic Survey  
MARGARET D. FOSTER, Geological Survey  
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WILLIAM J. BAILEY, University of Maryland

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# Is Plant Pathology a Fake?\*

**Russell B. Stevens**

*Professor of Botany, George Washington University*

Several years ago, at the very last session of an elaborate Golden Jubilee celebration of the American Phytopathological Society, J. G. Horsfall spoke to the problem of plant pathology as an art and as a science. There were only a few score of us in attendance, but the argument was well put and convincing—fortunately it has since become available in print.\*\* In essence we were urged to recognize that what we call plant pathology has two aspects: (1) the art of disease diagnosis and control; and (2) the science of disease investigation. It was even suggested that there be different curricula and separate advanced degrees for individuals looking toward one or the other of these areas of effort.

Certainly there is an art of plant pathology. Our title might then have been more precisely put, "Is the science of plant pathology a fake?" or, less flamboyantly, "Is there a science of plant pathology?" We shall address ourselves to this point from here on.

By whatever standards one chooses to apply, plant pathology has many dimensions. The causal agents of disease run from the inanimate to the animate; from viruses to flowering plants. The crops affected are horticultural and agronomic, cultivated and uncultivated, commercial and private, marketable and ornamental, and are involved anywhere from seedling to adult, from planting to consumption. Host-parasite relations are specific

and non-specific, local and systemic, in the aggregate affecting all parts in all ways. Most important, we plant pathologists are forced to the conclusion that what we do is a synthetic or derivative discipline; that is, we are involved with genetics, with physiology, with taxonomy, with soil science, with mycology, with virology, with nematology, and so on. The basic issue, then, is whether, when we remove, so to speak, the contributions of these supporting areas, there is anything left. Is there anything which belongs to pathology alone? If it is properly to be called a science, there must be unique points of view, concepts, and methods of attack. Does it have these?

Let me assume that there is something left and examine the implications of the position plant pathology occupies. I think they might be stated as follows:

1. Pathology faces, in exaggerated form, the dilemma of biology vis-a-vis mathematics, physics, and chemistry. Just as the biologist is unavoidably a less-than-professional mathematician, physicist, and chemist, so the plant pathologist is destined to be a second-rate geneticist, physiologist, microbiologist, and agronomist in pursuing his pathology. Sheer time and labor limitations make this inevitable; one cannot hope to be wholly competent in the contributory areas.

2. As a science compounded of others, plant pathology's unique problems and points of view appear only belatedly to oncoming scientists. Many promising students are lost along the way to the more clearly defined disciplines, and we must, on the average, settle for less than our share of the talent available when in truth, perhaps, we need more.

3. The problems of special interest to

\* Adapted from an address before the Botanical Society of Washington, October 3, 1961.

\*\* Horsfall, J. G. A Look to the Future—the Status of Plant Pathology in Biology and Agriculture. In Holton, C. S., ed. *Plant Pathology—Problems and Progress 1908-1958*. The University of Wisconsin Press, pp. 63-70 (1959).

pathology have not usually the elegance and precision so appealing to the research man and fashionable today.

Two rather recent personal experiences described below may illustrate the points just enumerated.

We have just completed a ten-year survey of pertinent material in the USDA library and have prepared a so-called bibliography of reviews, including doctoral dissertations. In the more than 2,500 items turned up there was certainly no dearth of reviews and theses in fields contributory to pathology, but there were very few in what I would call pathology, *per se*. Yet our sample of this kind of literature should, if anything, be biased in favor of the broad point of view.

A committee, of which I am a member, is now well along in preparing a "source-book" of laboratory and field exercises to be used in the introductory pathology courses. We started out to solicit those exercises already in use, stressing in our appeal that we wanted exercises which bore on what, for lack of a better term, we had to call "principles" of plant pathology. As I recall it, we got none whatsoever. True, there were plenty of exercises in mycology, in one or another symptom expression, in nematology, and so on, but none that could not have appropriately belonged in a supporting discipline or in a course on the art of pathology. It has apparently not occurred to teachers of plant pathology to teach the science of plant pathology; they teach either the art of pathology or the science of something else.

This is not the place to describe the practice of plant pathology as an art or to summarize the work of its supporting disciplines. The work is generally of high caliber, well staffed, and adequately supported, but hardly of first priority. My special plea is for attention to that ill-defined group of problems which have more than once been dubbed unfashionable. However, I do not plead for them because of their unfashionable status—however this might add to their charm—but be-

cause I am persuaded that they, and they very nearly alone, constitute the science of plant pathology. Unless we emphasize them, our science is a fake.

It is embarrassingly difficult to cite examples of what I have in mind. Much contemplation has brought to my attention fewer than a dozen, though there must be others. These are, briefly, and in no conscious order of importance:

1. Analysis of disease loss.
2. Social impact of disease.
3. The disease aspects of introducing our domestic varieties into foreign areas.
4. The geographic origins of pathogens.
5. Inoculum potential and dynamics.
6. The logistics of vector activity.
7. Epidemic patterns.
8. Disease forecasting.
9. Instrumentation in pathology.
10. Biological warfare research (not on the basis of its possible use in conflict, but because valuable insights might be obtained should we completely reverse our traditional approach; e.g., by trying to make disease worse experimentally, we might discover unpredictable data on how better to control it).

Some of these areas are hardly touched, while others have received a bit more attention, and I doubt that it would be appropriate to detail the existing literature on any one of them. But whether or not this list is complete, whether or not it has inaccuracies, these are, with no crucial exceptions, programs which are peripheral to plant pathology as it is now carried on. They tend to be carried out by men already established in more orthodox fields, or to be done as a sort of spare time activity. And, incidentally, they receive more attention in foreign countries, whatever that may imply. We do not find graduate students willing to risk specializing here, and I think we must somehow remove the barriers to vigorous prosecution of these, to me, core items. True, some may re-



quire sophisticated methods—operations research, systems analysis, mathematical models, whatever these popular terms mean. But first we must make a start on improving the climate of opinion.

It will be difficult to find graduate students willing to undertake this kind of research, and even more difficult to arrange interdepartmental programs for them, once we have them ready to begin. Indications are that money for research grants can be got only with great difficulty in competition with the narrower fields. It may be hard to find jobs for the products

of the graduate program once they are ready. These make more difficult, but they do not rule out, the successful accomplishment of the objective.

My final answer, then, must be: There is an art of plant pathology, as we now do it, is largely a fake. But it need not be, if we will stop concentrating on things that *contribute* to plant pathology and start working on those things which *are* plant pathology. The first job is to get rid of the unwarranted procedural and psychological barriers that get in our way.

## Membership to Vote On Officers, Dues Increase

Annual elections of Academy officers for 1962 will be held in December, as usual, by mail ballot. Not later than December 15, the secretary will send out, for approval of the membership, the following slate of candidates selected by the Nominating Committee:

For president-elect: Heinz Specht of the National Institutes of Health.

For secretary: George W. Irving, Jr., of the Agricultural Research Service, USDA.

For treasurer: Malcolm C. Henderson of Catholic University.

For manager-at-large, 1962-64 (two to be elected): Bernice Eddy (NIH), Kathryn Knowlton (NIH retired), Harold H. Shepard (USDA), and Russell B. Stevens (GWU).

For manager-at-large, 1962-63: Leo Schubert (American University). Dr. Schubert would replace Herbert Freidmann, who has left the Washington area.

To be valid, the ballots must be returned to the secretary before the first Thursday in January.

The new officers will take office at the

close of the annual meeting in January. At the same time, Benjamin D. Van Evera, current president-elect, will automatically assume the presidency.

Previously-elected managers-at-large who will continue in office during 1962 are W. G. Brombacher and A. O. Foster (class of 1960-62), and A. F. Forziati (class of 1961-63).

Delegates to the Board of Managers, in accordance with the recently-revised by-laws, will continue in office until new selections are made by the respective affiliated societies.

**Concurrently with the election of officers, the membership will be asked to approve an increase in annual dues from \$6 to \$10 for resident members, and from \$5 to \$7.50 for non-resident members.** This action was unanimously endorsed by the Board of Managers at its meeting of October 3. (See also President Abelson's message on the dues increase, and the notes on the October Board meeting, elsewhere in this issue.)

## The Proposed Dues Increase

You have been asked to consider increasing your dues to the Washington Academy of Sciences. Your Board of Managers has unanimously and emphatically recommended that you vote to change dues of resident members from \$6 to \$10 a year and of non-resident members from \$5 to \$7.50 a year. I want to tell you why I concur with this recommendation and join in asking you to vote for this increase.

Those who work for the Academy are proud of it. It is the organization for the advancement of science in the Washington metropolitan area, a local counterpart of the American Association for the Advancement of Science. Being local, it stresses service to the community, the advancement of science being a by-product of its activities. It is the one organization in Washington that can act and speak for all the scientists of this area. It has performed much valuable services in many ways, particularly in relation to secondary education. An outstanding recent example was participation in a week-long Institute on Isotopes and Radioactivity.

It had become obvious that this community needs to know more than it does about radioactivity, its hazards and its benefits. "Fallout" is an ominous word now known to everybody. Scientifically, what lies behind it? What does it really mean and what can we do about it? The Academy and its Joint Board of Science Education decided to act through the secondary schools of this area. With the cooperation of the Carnegie Institution of Washington, the school systems of the area, the Institute of Nuclear Studies at Oak Ridge, Tenn., and other groups, a short course on radioactivity and its effects was organized for the science teachers of our secondary schools. Conducted at the headquarters of the Carnegie Institution, the course con-

sisted of morning talks by the best lecturers obtainable, followed by afternoon laboratory work using equipment for the detection and estimation of radiation, including more than 40 Geiger counters. While these teachers were away from their own classes, other scientists—members of the Secondary Schools Contacts Committee or scientists procured by them—were substituting in the schools.

The foregoing is only one example of the public service that the Academy provides. In addition, it offers frequent lectures on various important scientific subjects, as well as on important topics of more general interest. Lectures are open to teachers, students, and all others who are interested. Here, scientists of different disciplines get to know one another and to broaden their outlook. The Academy provides stimulation and guidance for its Junior Academy. It seeks out and publicly recognizes the younger professional scientists who are making their mark in research or teaching. It publishes this *Journal*, reflecting the scientific life of this area and the subjects discussed in meetings of the Academy and of its affiliated societies. It will publish, we hope, a joint directory of the members of the Academy and its affiliated societies. On controversial, science-connected questions, the Academy can take a public position.

One could go on at length pointing out the accomplishments and potentialities of the Academy. Even greater accomplishments can be attained if we get behind it with more dollars, greater attendance at meetings, more contributions to the *Journal*, and proposals of many more scientists for membership. The Washington Academy of Sciences can be a great organization. Let's make it so!

—Philip H. Abelson

# Radioisotopes Institute

## Proves Big Success

A week-long institute, or special course, on "Isotopes and Radioactivity," designed to acquaint secondary school science teachers of the Washington area with the role of radioactive isotopes in science and civil defense, was held October 30-November 3 at the Carnegie Institution of Washington. It attracted much favorable attention from the press, radio, and television, and drew enthusiastic praise and thanks from the participants.

Conceived by Philip H. Abelson, president of the Washington Academy of Sciences, the Institute was sponsored by the Academy and the Joint Board on Science Education. At the request of Dr. Abelson, the morning lecture and afternoon laboratory curriculum was organized by Ralph T. Overman, chairman of the Training Division of the Oak Ridge Institute of Nuclear Studies. About 140 teachers from parochial, private, and public schools were released from their classrooms to take this intensive course, one or two from each school. Their classes were met by scientists and engineers who had volunteered through the Joint Board to substitute for them.

The first meeting of the Institute, in the auditorium of the Carnegie Institution, was attended not only by the chosen teachers but by many interested members of the Academy. Dr. Abelson sounded the keynote of the Institute. Discussing its objectives, he said,

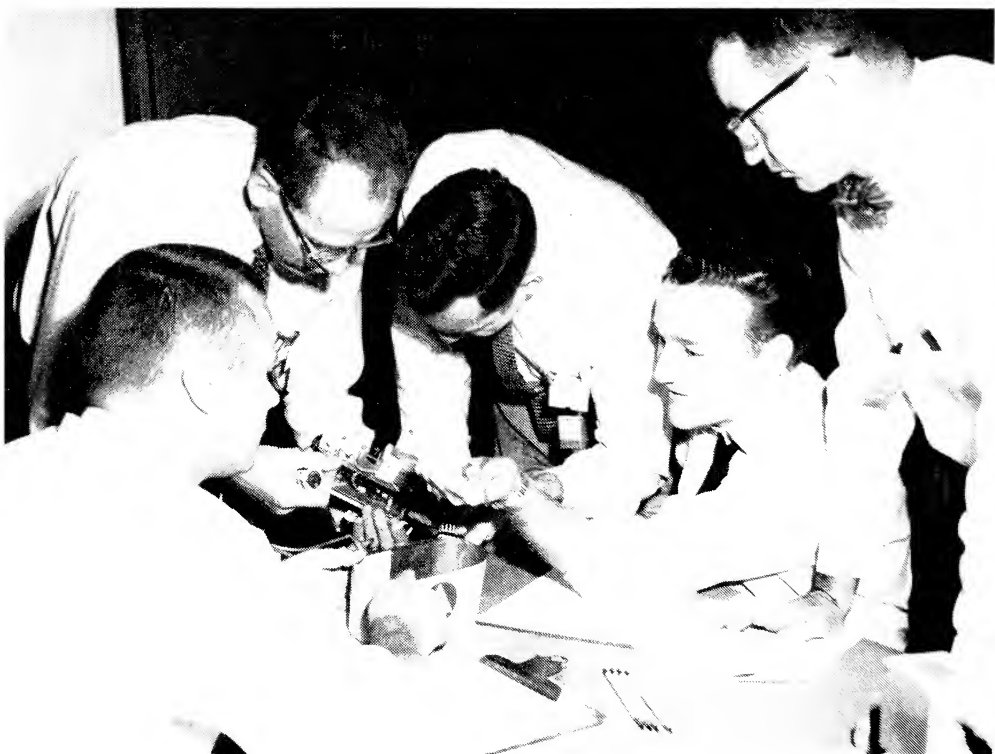
"Atomic energy already has many important applications in scientific research and technology, and these uses are certain to expand greatly in scope and importance. The increasing role of reactors in furnishing energy for electric power competitive with other fuels is a step toward the day when almost all of civilization's energy needs will be met by atomic energy. Radio-

active isotopes are employed in virtually every branch of experimental science and the uses are increasing rapidly, especially in chemistry and the medical and biological sciences. Radioactive isotopes are especially useful in performing many simple but instructive experiments which can be a means of interesting students in science. In view of these factors, the teaching of additional information on radioactivity would be desirable even if there were no fallout problem.

"Attaining a maximum capability of living with radioactivity is one of the most important problems facing the nation today. Unfortunately, the present level of knowledge throughout the citizenry is extremely low. As a result, many millions of lives could be needlessly lost in panic, and many more from failure to deal properly with fallout. Radioactivity is now inexorably part of our lives, and we must know enough to behave rationally in any circumstance. Even the briefest training could save many lives, just as practice fire drills have prevented many tragedies. If we adults are responsible citizens, we will try to give the young an enhanced chance of survival.

"The practical mechanism for teaching almost any subject is through the schools. Eventually all students in the secondary schools should receive instruction in the fundamentals of radioactivity. Unfortunately, only a few high schools are capable of giving such training. In part the deficiency is in equipment, but principally the problem is lack of trained instructors. Under normal circumstances, many years might elapse before this latter deficiency would be overcome. In view of the urgency of the problem, unusual measures should be taken. A desirable objective is that at least one teacher in each high school of





the nation should be capable of giving instruction in radioactivity. The essential information could then be disseminated if the knowledgeable instructor taught other teachers and also the students. The Institute on Isotopes and Radioactivity will largely fill this objective for the metropolitan area of Washington. Thus, it could be a useful model for other areas in the country."

Dr. Overman was the principal lecturer of the Institute. One teacher of long experience was heard to call him a virtuoso. He lectured first on nuclear reactions and modes of radioactive decay, speaking with extraordinary grace and clarity and using a blackboard to illustrate the concepts involved. A coffee break was followed by a lecture by Paul C. Aebersold, director of the Office of Isotopes Development, Atomic Energy Commission, on uses of isotopes in industry. Then came a short report by Richard Banks of D.C.'s Stuart Junior High School, on the use he had made of radioactive tracers in his classes.

At the end of the morning session, the guests departed and lunch provided by the Carnegie Institution was served by a caterer to the teachers and their instructors in an adjacent room. Each teacher was given a schedule of assignments in the laboratory, and thus knew the names of his instructor and the three teachers with whom he would work. There were six sections and instructors and six groups of teacher-trainees in each section. Within two minutes after the teachers entered the laboratory, they were at their Geiger counters, immersed in their afternoon's measurements.

The activities of the remaining four

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UPPER—WAS President Abelson assists a teacher participant in pipetting a 10-microliter sample of  $\text{Cl}^{38}$  solution from an Erlenmeyer flask. The sample, prepared in the University of Maryland reactor, will be dried and its half-life determined in a Geiger counter.

LOWER—Five teachers participating in the course examine the workings of a monitoring apparatus used by OCD.

days were like those of the first. Every morning Dr. Overman called for questions on the previous day's work. Then he lectured on successive days on detection of radiation, interaction of radiation with matter, characterization of radiation, and radiological safety. Each day a different lecturer followed Dr. Overman.

Charles W. Shilling, M.D. (Capt. USN ret.), recently deputy director of the Division of Biology and Medicine, Atomic Energy Commission, and now director of the Biological Sciences Communications Project, American Institute of Biological Sciences, gave a splendid example of oral communication with visual aids when he lectured on the biological and medical uses of isotopes and biological effects of radiation.

James L. Liverman, chief of the Biology Branch of the above-mentioned Division of the Atomic Energy Commission, talked on the uses of isotopes in agriculture, citing the eradication of the screw worm fly, a serious pest of cattle, from the southeastern United States by the release of millions of artificially-reared flies sterilized by exposure to radiations from an isotope of cobalt.

W. Wayne Meinke, Department of Chemistry of the University of Michigan, lectured on uses of isotopes in chemistry.

Walmer E. Strobe, director of research, Office of Civil Defense, talked on "Radiation and Civil Defense" and showed a motion picture on the test occupancy of a fallout shelter by several families with children.

Laboratory instructors included Wilfred Mann and S. B. Garfinkel of the National Bureau of Standards; Richard Banks, William J. Saunders, Keith Johnson, Stephen Hopkins, and Archie Lucas of the D.C. Public Schools; and Patrick L. Parker of the Geophysical Laboratory, Carnegie Institution. Health physicists Abraham Schwebel and Thomas G. Hobbs of the National Bureau of Standards also took part in the laboratory work. The subjects of laboratory work were Geiger



counter experiments, isodose plot with ionization chamber, tracer experiments, detection of fallout, and autoradiographic localization of radioactivity.

The lecturers were impressed by the alertness and attentiveness of the teachers, and the laboratory instructors by their efficient work. At the end of the week the teachers were asked to evaluate their experience in the Institute. Some of their comments follow:

"I was most impressed with the clearness of the presentations. As a former science teacher of 25 years ago, I have felt that up-dating my general information in terms of present day knowledge could not have been packaged with any greater density. I am most grateful to all individuals and organizations for being permitted to be a party to this institute. In terms of today's living, I would say that no other area needs greater training for effective adjustment to future living."

"I'd like to express my very sincere gratitude for the opportunities offered to me this week. I found the lectures most informative, the lab set-up complete and convenient, the instructors patient and helpful, and the entire experience most educational. By sharing the information I have gained with my fellow teachers and students, I feel that I can be helpful in urging action toward safety preparations and promoting some clear, basic concepts of radiation danger.

"The friendly spirit of all connected with the Institute has certainly strengthened my faith in our way of life. I shall remember all these good people in my daily prayers."

"I feel that this was a rare opportunity—I hope that it will be repeated in many other areas in the very near future. I feel that the value to others not at this Institute will depend to a large degree on the ease and ability to obtain sample isotopes and equipment to use in passing on this wonderful experience and knowledge."

"This week has been very stimulating. It certainly gives me an opportunity to re-evaluate my program at school and include some materials on radioactivity. I feel more confident in the handling of these materials now. It is my hope that this kind of training will continue."

"I was very grateful for the opportunity. Everything was beyond my best expectations. You have even motivated me to take the NSF course in radiation chemistry that will be offered at American University next fall.

"The first lecture by Dr. Overman on the structure of the atom, etc., will be of great use to me in teaching chemistry. I appreciate it most of all."

"I think this has been one of the most beneficial experiences I have yet had from 'teacher institutes.' There was a good balance of lab experience with lecture presentation, both conducted on a level high enough to challenge and stimulate thought.

"My interest now is to find out even more in this field.

"The main difficulty in the school will be to find the time to set up the equipment and use it. In general much of the material will be wasted unless more time can be provided to present this material."

"I am very grateful for this opportunity, and intend to incorporate much of what I've learned into an adult education program which our community is launching."

"This institute has been extremely valuable and beneficial. It has served the purpose of presenting information of current importance in regard to isotopes and radioactivity which, in turn, permits the teacher to have a better and informative background for presentation to students."

"This week was highly informative to me. The momentum of the work gave no lag in time—in fact, time was too short to do the many things one wished to do. I feel I received more from this week's work than many full semester courses I have taken in advanced physics in universities. At least this was better handled than in many college courses."

"More institutes on this and other topics would be of tremendous help. Contact with professional experts is invaluable."

"The spirit of endeavor, the excellence of the lecturers and administrative effort displayed in the institute warrant the highest commendations. I am happy to have been a participant in this program."

"I have greatly benefited from every part of this Institute. There was a wealth of material gained, explained, and appreciated. We are very grateful, and have a great admiration for all you have done for us. We will try to reach out with all you have given us to those we can help."

Dr. Abelson wishes it were possible to name here all the participants in the Insti-

tute and all who helped to make it possible directly or indirectly. The Geiger counter equipment was provided by the Picker X-Ray Corporation, Nuclear-Chicago Corporation, Baird-Atomic, Inc., and Tracerlab, Inc. Civil Defense equipment was lent by the D.C. and Olney Regional Offices of OCD, and demonstrated by Cosmo J. Liberti of the Olney Office. Irradiation services were performed by the University of Maryland reactor and the Oak Ridge National Laboratory facilities. In addition, samples of fallout materials were furnished by Luther Lockhart of the Naval Research Laboratory. An apparatus for collecting fallout materials was lent by Frank B. Conlon, of the Division of Radiological Health, Public Health Service.

The logistics of the Institute were handled by staff members of the Carnegie Institution of Washington, including Philip H. Abelson, A. David Singer, F. A. Rowe, J. L. England, and E. J. Shipley of the Geophysical Laboratory; and Ellen Flack, Ailene Bauer, Joe Holdaway, and Leroy Dabney of the Administration Office, as well as Harold H. Young of the Atomic Energy Commission.

A most important indirect part was played by the Secondary Schools Contacts Committee of the Joint Board on Science Education. Walter H. McCartha is chairman of this committee and Grover C. Sherlin, vice-chairman. The members of the committee are scientists and engineers, one for each secondary school, who link science and technology in their schools with professional science and engineering outside. They are organized into eight divisions: i.e., two for the District of Columbia, two for the surrounding counties in Maryland,

two for the surrounding counties in Virginia, one for the parochial schools, and one for the private schools of the whole area—a total of 217 schools. Each division has its own chairman and vice-chairman. This is the organization that provided, from the professional scientific and engineering community, volunteer substitutes for the teachers who attended the Institute.

One of the projects of the Joint Board is the development and maintenance of a list of scientists and engineers, with their telephone numbers, who have expressed willingness to help the secondary schools in various ways. Copies of this list were in the hands of the chairmen of the divisions of the committee and were used by them for making the contacts necessary to procure the needed substitutes. Because very few volunteer substitutes could or would undertake to serve for 5 days, it was necessary to find up to ten or more substitutes for each absent teacher. That meant that several hundred substitutes had to be obtained in one way or another. Sometimes contacts were made by the science supervisors of the school systems and sometimes by administrators in agencies employing scientists or engineers. Some substitutes were professional teachers who were paid by the schools; in other cases professional substitutes attended the Institute. All in all, there was a sort of marvelously controlled nuclear reaction within secondary science education in this area, leading undoubtedly to new knowledge and ideas among the substitute teachers as well as among the members of the Institute.

## Frank Drake Is Speaker At Christmas Lectures

The tenth annual Christmas Lectures for students and their teachers will take place at Lisner Auditorium, George Washington University, on December 21 and 22 at 8

o'clock. Frank D. Drake, associate astronomer at the National Radio Astronomy Observatory, Green Bank, W.Va., will lecture on space science.

The Christmas Lectures, sponsored by the Philosophical Society of Washington, are designed primarily for high school and advanced junior high school students. Each year a distinguished scientist is brought to the area to present illustrated lectures on recent scientific developments.

Dr. Drake's first lecture is entitled, "Searching for Life in Space." The possibility of living things beyond the earth will be discussed, and methods used to search for them will be described. These involve the use of space probes; another technique is concerned with radio astronomy. The detection and interpretation of such signals will be demonstrated.

The second lecture is entitled, "Cosmic Radio Waves." The radio emission from the planets of the solar system will be described, together with a discussion of

how the study of this emission helps us to design space probes that will study these planets.

Dr. Drake is a graduate of Cornell and Harvard Universities. From 1955 to 1958 he was associated with the Agassiz Station Radio Astronomy Project of Harvard University, where he worked principally in 21-cm. astronomical research and in infrared techniques, as well as in optical astronomy. In 1960 he headed Project Oyma, the just-organized high sensitivity search for extra-terrestrial intelligent radio signals.

Admission to the lectures is by free ticket. Requests, accompanied by a self-addressed stamped envelope, should be sent to Prof. N. T. Grisamore, School of Engineering, George Washington University, Washington 6.

## THE BROWNSTONE TOWER



"It would be foolish to allow ourselves to be panicked into a system of higher education entirely subservient to our technological needs. The logic of survival demands that we nourish the philos-

opher along with the physicist." This quotation from an editorial in the *New York Times* will serve as our text for today.

Some nourishment for science is required if scientists are to emerge from our schools in larger numbers than in the past. How much and what kinds of nourishment are needed for the best results? Is it possible to overnourish our budding scientists, to be too solicitous, to disturb them and their teachers by providing too many "programs" for their benefit? This possibility is worth examining by the techniques of social science. The granting agencies of the Federal government seem to assume

that nothing but good for the country can come from the expenditure of money for the encouragement of science talent, the support of scientific research, and the training of science teachers. Every imaginable program for these purposes is being tried, as if to get a winning ticket by betting on every horse in a race.

We should stop concentrating on the production of scientists and instead encourage the production of scholars of all kinds, including scientists. My humanistic background tells me that more philosophers are needed inside and outside of government to apply common sense, or wisdom, where scientific data are lacking and that our nourishment for the production of scholars should include support for the humanities.

Students need, above all, opportunity to read widely and reflect, to talk among themselves and with their teachers, and to develop their philosophy of life; that is, to become scholars. If thereby a student comes to admire science as a way of life in pursuit of demonstrable truth and at the same time has faith in the brotherhood of man and love for literature, art, music,

sport, nature, etc., he will be a credit to science and an asset to the world.

Feeling as I do about the importance of providing opportunity for true scholarship, I was pleased to be invited to serve on the Advisory Council of the U. S. Army Junior Science and Humanities Symposia Program. Its first objective is "To promote the study of the sciences and mathematics, particularly at the high school level; to demonstrate the part which the humanities play in the development of the scientist; to emphasize the importance of both the sciences and the humanities to the national culture and general welfare." A JSH symposium may include papers by selected students, scientists, and humanists, observation and discussion of professional research in progress at or near the site of the symposium, free time for students to talk with one another, and career counseling, all within a period of three days. Such an experience, without fanfare and without any attempt to sell science or the Army's need for scientists, could not be harmful and might help a budding scholar to find himself.

What of the Radioisotopes Institute described in this issue? Was it a worthwhile endeavor? I think it was. It had a very practical purpose, not to sell science but to seed a knowledge of radioactive isotopes and their uses and abuses among the science teachers as a means of propagating this knowledge among students and other teachers. Coming as it did, by chance, just after the explosion of the 50 megaton bomb in the USSR, it had an extraordinary impact. It also demonstrated the wonderful ability of the members of this scientific community to cooperate and do promptly what needs to be done without benefit of a Federal grant. I am proud of the Washington Academy of Sciences and its president, and of all who helped him.

—*Frank L. Campbell*

## BOOK REVIEW

JOSEPH HENRY—TRAILBLAZER OF AMERICAN SCIENCE. Sarah R. Riedman. 224 pages. Rand McNally & Company, Chicago, Ill. 1961. Price \$3.50.

There are many things which educated Americans know about Joseph Henry: that he discovered electromagnetic induction and self-induction, the coefficient of which, the unit of inductance, is called the "henry"; that he constructed the first electric motor and invented the telegraph; that he was the first Secretary of the Smithsonian Institution. But there are many things that are not well known about this modest and self-effacing scientist which Washington scientists particularly will be interested to learn, since he made Washington the cradle of American science and instituted many scientific activities of the United States Government which since have been largely expanded in the service of science and country for the welfare and security of the Nation.

When James Smithson, the illegitimate son of the first Duke of Northumberland and a noted mineralogist, left a modest fortune of half a million dollars to the Government of the United States to establish "an institution for the increase and diffusion of knowledge among men," there was no better man to nominate as Secretary of the newly founded institution than the professor at the College of New Jersey (now Princeton University). It is a matter of record that this institution owes its existence as much to Henry as to Smithson, because it was Henry who, with an iron will and unmatched energy, protected Smithson's heritage against being squandered on petty pet projects of influential legislators, and, keeping faith with the intention of the donor, made the Smithsonian Institution what it is today, a focal point of American science.

It is not generally known that Henry, in addition to his epochal discoveries in the fields of electricity and magnetism, made

notable contributions in many other fields of science, especially in optics, acoustics, and meteorology. In less than ten years he established lighthouses on the 10,000 miles of shoreline of the United States, and equipped them with modern Fresnel lenses beaming the rays into parallel bundles. He helped mariners also by creating, on the basis of acoustic research, powerful sounding devices that could be heard in dense fog 20 miles away. In his capacity as Secretary of the Smithsonian Institution, Henry created the first National Herbarium, the first Zoological Park, the Bureau of Ethnology, and the U.S. Weather Service with volunteer watchers mapping daily atmospheric conditions and using the telegraph for their transmittal in order to make daily weather forecasts. With the help of the prominent naturalist, Spencer Fullerton Baird, he made a study of food fishes in coastal waters and thus laid the groundwork for the U.S. Bureau of Fisheries.

As the United States extended its frontiers to the West, he organized and facilitated numerous geographical and geological expeditions into uncharted territory, and it was his knowledge of the fish, timber, and mineral resources of Alaska that induced him to recommend the acquisition of Alaska from Russia in 1867. Realizing the difficulty which the scientists of his time had in procuring foreign publications, he instituted at the Smithsonian Institution an international exchange and distribution service as well as a bibliographic classification of scientific data.

If this sounds quite modern, it was the man who in his thinking was far ahead of his contemporaries. In the 1860's, when the spiritualistic craze was sweeping Washington and even the family in the White House, it was Henry who unmasked the impostors. When the battle over Darwin's "Origin of Species" raged among American scientists, not even his best friends Agassiz, Torrey, and Guyot could swerve

him from his conviction that all known facts pointed to the theory of evolution as "the best working hypothesis of the naturalists." Not only his thinking, but also many of his endeavors, are far advanced. During the Civil War he sent a balloonist up from the Smithsonian grounds and kept contact with him by wire, sending messages on observations by telegraph to President Lincoln. Thus the Smithsonian Institution became the midwife of the U.S. Air Force. And when the wounded—friends and foes alike—ran out of disinfectants, he ordered his staff at the Smithsonian Institution to prepare much-needed chemicals.

As a true scientist, Henry was always interested in the natural laws underlying observable phenomena, and as a practical man he was quick to realize their applicability. "All knowledge is useful," he wrote in one of his annual reports of the Smithsonian Institution, "and the discovery of today, though appearing unconnected with any useful process, may in the course of a few years become the fruitful source of a thousand inventions." This maxim may well serve scientists of our time as a keynote for action, and our Government in directing scientific activities.

In writing the biography of this remarkable man and farsighted scientist who was largely responsible for the founding of the National Academy of Sciences, the American Association for the Advancement of Science, and the Philosophical Society of Washington, Dr. Riedman not only provided much needed knowledge about the life and work of a real "trailblazer of American science," but also contributed greatly to a better understanding of the growth of the American scientific community and its institutions. Although the book is filled with a wealth of otherwise not easily obtainable information, it is a work of love for a most lovable personality which will be an inspiration to its readers.

—Francis J. Weiss



# Science in Washington

## SCIENTISTS IN THE NEWS

*This column presents brief items concerning the activities of members of the Academy. Such items may include notices of talks given, important conferences or visits, promotions, awards, election to membership or office in scientific and technical societies, appointment to technical committees, civic activities, and marriages, births, and other family news. Formal contributors are assigned for the systematic collection of news at institutions employing considerable numbers of Academy members (see list on masthead). However, for the bulk of the membership, we must rely on individuals to send us news concerning themselves and their friends. Contributions may be addressed to Harold T. Cook, Associate Editor, U. S. Department of Agriculture, Agricultural Marketing Service, Room 2628 South Building, Washington 25, D. C.*

## APPLIED PHYSICS LABORATORY

**A. M. Stone**, technical assistant to the director, attended the 15th National Conference of Research at San Juan, P. R., October 9-15. From October 19 through October 22, Dr. Stone participated in the third Strategy of Peace Conference at Airlie House, Warrenton, Va.

## COAST AND GEODETIC SURVEY

**E. M. Roberts** is the author of a recently-published book, "Deep Sea, High Mountain," which consists of true stories about the field work activities of the Coast and Geodetic Survey.

## DAVID TAYLOR MODEL BASIN

**Francois N. Frenkiel**, Applied Mathematics Laboratory, served as chairman of the International Symposium on Fundamental Problems in Turbulence and their Relation to Geophysics, held at Marseilles, France, September 4-9. The symposium was sponsored by the International Union of Geodesy and Geophysics and the International Union of Theoretical and Applied Mechanics.

## GEOLOGICAL SURVEY

**Joseph J. Fahey** presented a paper on "Wegschleiderite, a New Saline Mineral from the Green River Formation, Wyoming," during the annual meeting of the Mineralogical Society of America, Cincinnati, November 2-4.

**Alfred M. Pommer** has been appointed chair-

man of the Biochemical Analysis Committee, Biomedical Sciences Division, Instrument Society of America.

**Dorothy Carroll** attended the first Coastal and Shallow Water Research Conference, Atlantic Regional Meeting, Baltimore, October 20-21. The conference was sponsored by the National Science Foundation and the Office of Naval Research.

During October, **Edwin W. Roedder** spoke on "The Study of Fluid Inclusions in Minerals" to the Geology Departments of Lehigh University and Princeton University, and to the Philadelphia Mineralogical Society.

**Raymond L. Mace** attended a symposium on ground-water resources in arid zones, sponsored by the International Association of Scientific Hydrology in Athens, Greece, October 9-20. In a meeting with the Council of the Association he discussed possibilities of world-wide cooperation in a proposed International Decade of Scientific Hydrology. He also attended a meeting of a working group of the American Standards Association, which is studying criteria for selection of sites for disposal of low-level radioactive waste, in Chicago November 6-7.

## UNIVERSITY OF MARYLAND

**John S. Toll**, chairman of the Physics Department, is on leave during 1961-62. He is spending the first semester of the academic year at Lund, Sweden, where he is engaged in research work at the Institute for Theoretical Physics. **Howard J. Laster** is acting chairman of the Department during Dr. Toll's absence.

**S. Fred Singer**, who is in charge of the space research program in the Physics Department, is on leave for research at the Jet Propulsion Laboratory of the California Institute of Technology, and later will spend some time at Princeton.

**Harry D. Holmgren**, formerly on the staff of the Naval Research Laboratory, has become an associate professor in the Physics Department.

**Gianni Quarenì**, a high energy physicist at the University of Bologna, is visiting associate professor of physics for the present academic year. His wife, Angela Vignudelli, will serve as a postdoctoral research assistant in physics.

## USDA, BELTSVILLE

**C. H. Hoffmann**, assistant director of the Entomology Research Division, was guest speaker at the 57th Annual Convention of the International Association of Ice Cream Manufacturers on October 27, in Washington. He spoke on "New Concepts in Controlling Farm Insects."

During October, **Lawrence Zeleny** attended meetings at Chicago, Dallas, Fargo, Fort Worth, Great Falls, Huron, and Kansas City, to explain and demonstrate to the grain trade and Department of Agriculture officials the use of the sedimentation test for estimating the bread-baking strength of wheat. This test will be used as a basis for loan premiums in the Department's 1962 wheat price support program.

**F. P. Cullinan**, associate director of the Crops Research Division, was awarded the Charles Reid Barnes Life Membership of the American Society of Plant Physiologists at the annual banquet of the Society during the AIBS meetings at Purdue University, Lafayette, Ind., in August.

**E. F. Knipling**, director of the Entomology Research Division, and **R. C. Bushland**, investigations leader of Livestock Insect Research at the Kerrville (Tex.) laboratory of ERD, were joint recipients of the John Scott Award for their part in the development of the sterile male method for screw-worm eradication. The award was presented during the meeting of the Eastern Branch of the Entomological Society of America, held in Baltimore in October.

**Myron S. Anderson**, ARS, attended the National Meeting of the American Chemical Society in Chicago in September. He presented a paper entitled, "A Look at Composts," before the Division of Fertilizer and Soil Chemistry.

**Arthur W. Lindquist** was a recipient of the Department's Distinguished Service Award this year "for original research and forceful leadership in improving the health and welfare of man and livestock through the development of new methods for controlling insects of medical and veterinary importance." Dr. Lindquist has been chief of the Insects Affecting Man and Animals Research Branch, ARS, since 1953. During World War II he was a member of the team at the Department's Orlando laboratory, which developed a method of impregnating clothing with chemicals to protect military personnel from disease-carrying insects, for which the team received the Department's Distinguished Service Unit Award in 1947.

#### USDA, WASHINGTON

**Edward H. Graham**, director of Plant Technology, Soil Conservation Service, has been appointed representative of the Ecological Society of America to the International Union of Biological Sciences.

On October 30, **George W. Irving, Jr.**, was toastmaster for the Harvey W. Wiley Award Banquet sponsored by the Association of Official Agricultural Chemists at the Shoreham Hotel.

**Hazel K. Stiebeling**, director of the Institute of Home Economics, spoke at the Food and Nutrition Conference for Students and Alumnae

of the School of Home Economics, Ohio State University, on October 21. Dr. Stiebeling spoke on "Opportunities in Nutritional Sciences" at a conference commemorating the Land-Grant Centennial at Virginia Polytechnic Institute, November 3-4.

#### UNCLASSIFIED

**Donald B. McMullen**, leader of the WHO Bilharziasis Advisory Team and on leave from the Walter Reed Army Institute of Research, will continue his association with Endemo-epidemic Diseases, Division of Communicable Diseases, World Health Organization, at Geneva, Switzerland, until the end of 1962. This inter-regional team, organized in 1958, has reviewed the bilharziasis problem in 16 countries, evaluated control measures, and attempted to coordinate them with agricultural and water resources development.

**Bernard Frank**, professor of watershed management at Colorado State University, Fort Collins, a former member of the Forest Service, in Washington, has been awarded a grant by the Conservation Foundation of New York to prepare a textbook—the first of its kind—on watershed management. Collaborating with Mr. Frank is Robert E. Dils, leader of the Colorado State University Cooperative Management Unit. The book is scheduled for publication in 1963.

#### DEATHS

**Paul Renno Heyl** died in October at the age of 89. Dr. Heyl was born in Philadelphia and received both his bachelor of science and Ph.D. degrees from the University of Pennsylvania. He taught physics in Philadelphia and Reading from 1898 to 1910, then joined a commercial research firm in New York City. In 1920 he joined the Bureau of Standards, where he became chief of the Sound Division. He retired in 1942, but served as a consultant in physics and mathematics for several Government and industrial projects during the War. His invention of the earth induction compass first made aerial navigation possible.

#### AFFILIATED SOCIETIES

##### Acoustical Society of America, Washington Chapter

A demonstration talk by Edith Corliss, NBS, entitled "Through the Hearing Aid," was held on November 20 in the Exhibit Room of the Industrial Building, NBS. An informal dinner at the Cafe Burgundy preceded the meeting.

##### American Institute of Electrical Engineers, Washington Section

The general meeting on October 11 presented Wm. J. Ellenberger, DOD, on the topic, "Planning the Structure of the Engineering Profession

to Achieve Unity." We are interested to note in the November bulletin of the Section a paragraph to the effect that a movement is underway to combine the AIEE with the IRE as a single engineering society, which may bear on the same general issue.

William B. Kouenhoven of Johns Hopkins, addressed the Section on November 9 on the subject, "The Effect of Electric Shock on Humans."

This year's Student Night, November 14, featured a tour of the National Bureau of Standards, the first time in many years that certain of the laboratories have been open in the evening for an event of this kind. Chester H. Page, former editor of the *Journal*, highlighted some of the research and development activities of the Bureau in a talk beginning at 7:30 p.m.

The Aero Space Technical Group sponsored a visit on November 15 to the Goddard Space Center at Greenbelt.

#### **American Meteorological Society, D. C. Branch**

Richard J. Reed of the University of Washington, presently visiting scientist at the National Meteorological Center, addressed the Branch on "Surprises in the Equatorial Stratosphere." He dealt particularly with wind and temperature fluctuations which oscillate in a cycle that does not appear simply connected with annual transit of the sun across the equator.

#### **American Society of Civil Engineers, National Capital Section**

The October luncheon meeting, on the 24th, heard Archie N. Carter, of Carter, Krueger & Associates, speak on the "Local Impact of Federal Programs," with special reference to such projects as the St. Lawrence Seaway, the Atomic Energy program, and the Interstate Highway System.

Rep. Robert F. Ellsworth (Kansas) addressed the November dinner meeting of the Section on the topic, "An Engineer in Politics."

On November 28, at the regular luncheon meeting, Maj. Gen. James B. Lampert, Corps of Engineers, in a talk entitled "Civil Engineering in Missile and Space Programs," considered the impact of these construction programs on the Civil Engineering profession, particularly from the standpoint of management.

The November "Civil Engineer" notes that 120 members of the Section have volunteered to help area high schools in such instances as the recent institute on radioactivity attended by science teachers.

#### **American Society of Mechanical Engineers, Washington Section**

Eldon E. Sweezy, management consultant to the Department of the Army and an instructor at American University, addressed the October

26 meeting of the Section on "Managers of Creative Engineering," dealing with scientific organizations, laboratories, and engineering, *per se*.

Much publicity, naturally, attended the presentation on November 9, by Antole Kuznetsov, Third Secretary of the Soviet Embassy, of a talk on "Achievements of Soviet Industry," and a film on the flight of Maj. Titov, the cosmonaut.

#### **Chemical Society of Washington**

The November 9 meeting, held at Walter Reed Institute of Research, featured a panel discussion on "The Chemical Origin of Life," in which the participants were Philip H. Abelson of the Geophysical Laboratory and Sidney W. Fox of the Oceanographic Institute, Florida State University. Dr. Abelson spoke on "Chemical Reactions in the Primitive Environment," and Dr. Fox on "Origin of Protein Macromolecules and of Supramolecular Systems."

Two topical group meetings were held before the general meeting. Alfred Burger of the University of Virginia addressed the Organic Group on "Medicinal Chemistry—Its Problems, Hopes, and Dilemmas," and H. W. Koch of the National Bureau of Standards addressed the Physical Group on "Research with High Energy X-rays and Electrons."

A record group of over 350 persons participated in the annual elections that preceded the general meeting. The following officers were elected for 1962: Alfred E. Brown, president-elect; Alphonse F. Forziati, secretary; and Leo Schubert, treasurer.

#### **Columbia Historical Society**

November 11 was the Annual Homecoming at the Heurich Memorial Mansion, 1307 New Hampshire Avenue, N.W.

"Old Washington Houses as Seen by an Outsider," was the subject of an illustrated talk on November 17 by Mrs. J. R. Longard, a member of the Old Houses Group of the University Women's Club of Halifax, Canada. She and her husband, an experienced photographer and associated with the Canadian Joint Staff, have walked the streets of Washington studying the architecture of 100-year old houses.

November 25 marked the opening afternoon reception, in the Powell Auditorium, of an exhibit entitled "Prints and Photographs of Washington During the Civil War."

#### **Geological Society of Washington**

"Paleontological Pitfalls," a group of short talks illustrating the diversity of paleontological work and some lapses and progress in its philosophy, with examples from recent history of the profession, constituted the program for November 8. Speakers were Erle G. Kauffman, U.S. National Museum, and Frank C. Whitmore, Mackenzie Gordon, Jr., Nicholas Hotton, III,

and William A. Oliver, all of the Geological Survey.

The regular program of November 29 included a 30-minute color film of the eruption of Kilauea, 1959-60, introduced by Edwin Roedder, and papers by Wallace E. Stener, Stanford University, on "Major Powell and the Beginnings of the Conservation Movement," and E. C. T. Chao, USGS, on "The Ries Crater of Southern Germany—Meteorite or Volcanic?"

#### **Helminthological Society of Washington**

Five papers constituted the program of the 382nd meeting of the Society on November 30 in Wilson Hall, NIH: "Variation in Susceptibility of Inbred Mice to *Cepitercus fasciolaris*," by A. W. Cheever; "The Effect of Dead Worms on the Development and Progress of Experimental Hepato-splenic Schisto-somiasis mansoni in Mice," by K. S. Warren; "In Vitro Studies on the Maintenance and Early Development of *Dirofilaria immitis* Microfilariae," by J. K. Sawyer and P. P. Weinstein; "The Nutritional State of the Host in Relation to Experimental Malaria Chemotherapy," by R. L. Jacobs; and "Metastatic Calcification in Rats Due to Hytakerol as Modified by Infection with *Plasmodium berghei*," by T. I. Mercado.

#### **Insecticide Society of Washington**

Two papers by members of the Entomology Research Division, USDA, were presented at the November 15 meeting of the Society: "10th Pacific Science Congress—Insect Problems in the Pacific Area," by L. F. Steiner, and "What is the Trend in Insect Control Agents?" by Stanley A. Hall.

#### **Institute of Radio Engineers, Washington Section**

At the general meeting, November 13, Paul H. Robbins, executive director of the National Society of Professional Engineers, spoke on the subject, "Your Technology Is Not Enough."

Technical meetings during the month of November included the following: November 1—"Application of Computer Systems to Air Traffic Control"; November 7—"How Smart Can You Be—Is Electronic Sophistication Debasing our Defense Picture?"; November 14—"High Power Microwave Switching, Using Gas and Vacuum Techniques"; November 20—"The Possible Use of VHF Television Frequencies for Land Mobile Communications"; and November 21—"Solution of a Space Rendezvous Problem."

#### **Medical Society of the District of Columbia**

The 29th Annual Scientific Assembly of the Medical Society of the District of Columbia was scheduled for November 27-29, with sessions on cholesterol and its metabolism, tranquilizers and antidepressants, and the "The Physician's Role

During the First 30 Minutes," the last concerned with accident victims of all kinds. Panel discussions in the afternoons treated as subjects: diet and atherosclerosis, use of tranquilizers and antidepressants, and responsibility in assuming emergency medical care. A number of specialty meetings on cardiac problems, radiology, surgery, malignancy, internal medicine, and anesthesiology completed the assembly.

Most of the events cited in the monthly list of Current Medical Events are, understandably, of a technical nature. We note, however, a panel discussion on November 8 on the general topic, "The Relation of Religion to Medicine," a paper at Columbia Hospital on "Medical Legal Matters," one at Sibley Hospital on "Soma's Influence on the Psyche," and a closed session at Georgetown University which considered the place of genetics in the curriculum of the medical student.

#### **Philosophical Society of Washington**

On November 25, Robert P. Madden, NBS, addressed the Society on the subject, "Emancipation of Far Ultraviolet Physics."

#### **Society of American Military Engineers, Washington Post**

Harris B. Stewart, Jr., Coast and Geodetic Survey, was featured speaker at the November 20 luncheon meeting, and presented a talk on "The Challenge of Oceanography."

## **CALENDAR OF EVENTS**

*Events which will take place, so far as we can determine at the time of writing, are noted below. Where no indication of the program other than date appears, it will in most instances be a regularly-scheduled meeting of the society. Last-minute changes in time and place, or emergency cancellations, cannot be reflected here.*

#### **December 11—American Society for Metals, Washington Chapter**

Joint meeting with the American Welding Society. "Diffusion Bonding," with a speaker from the Battelle Memorial Institute, Columbus, Ohio. AAUW Building, 2401 Virginia Avenue, N.W., 8:00 p.m.: dinner at 6:30 p.m.

#### **December 11—Institute of Radio Engineers, Washington Section**

Museum of Natural History, 8:00 p.m.

#### **December 12—American Society of Civil Engineers, National Capital Section**

Powell Auditorium. Dinner, 6:30 p.m.; program, 8:00 p.m.

#### **December 13—American Institute of Electrical Engineers, Washington Section**

"Air Safety," by James T. Pyle, Federal Avia-



tion Agency.

PEPCO Auditorium, 10th and E Sts., N.W.,  
8:00 p.m.

**December 13—Geological Society of Washington**

Powell Auditorium, 8:00 p.m.

**December 14—Chemical Society of Washington**

Topical Group meetings at 5:00 p.m.: *Biochemical*, Paul L. Day, Food & Drug Administration, "The Science of Biochemistry: Past, Present, and Future"; *Organic*, Milton Orchin, University of Cincinnati, "Cis-trans Isomerization Catalyzed by Selenium"; *Physical*, George K. Fraenkel, Columbia University, "Determination of Electron Distributions from Electron Spin Resonance Spectra"; *Analytical*, Bourdon F. Scribner, NBS, "An Analytical Tour of West Europe." At NIH, various locations.

Cocktails at 6:00, dinner at 6:45, at Naval Medical Center.

General meeting at 8:15: Karl A. Folkers, Merck and Company, "Newer Aspects of Chemical and Biological Research on Coenzyme Q." At NIH, Clinical Center Auditorium.

**December 14—American Society of Mechanical Engineers, Washington Section**

Regular meeting in area of nuclear engineering and heat transfer.

PEPCO Auditorium, 10th and E Sts., N.W.,  
8:00 p.m.

**December 15—Helminthological Society of Washington**

Open program meeting featuring notes from the floor.

American University, 8:00 p.m.

**December 18—Acoustical Society of America, Washington Chapter**

National Bureau of Standards, 8:00 p.m.

**December 18—Society of American Military Engineers, Washington Post**

YWCA, 17th and K Sts., N.W. Luncheon at noon.

**December 19—Anthropological Society of Washington**

Room 43, Museum of Natural History, 8:15 p.m.

**December 20—Insecticide Society of Washington**

Symons Hall, University of Maryland, 8:00 p.m.

**December 20—Washington Society of Engineers**

Powell Auditorium, 8:00 p.m.

**December 21—Society of American Foresters, Washington Section**

YWCA, 17th and K Sts., N.W. Dinner meeting at 6:30 p.m.

**December 21-22—Philosophical Society of Washington**

Christmas Lectures by Frank D. Drake, National Radio Astronomy Observatory, Green Bank, W. Va.

Lisner Auditorium, George Washington University, 8:00 p.m.

**December 26—American Society of Civil Engineers, National Capital Section**

"Highways in Russia," Francis Turner, Acting Commissioner of Public Roads.

YWCA, 17th and K Sts., N.W. Luncheon at noon.

**December 26—Society of American Bacteriologists, Washington Branch**

Walter Reed Medical Center, 8:00 p.m.

**December 27—American Society of Civil Engineers, National Capital Section**

Christmas party.

**December 28—American Society of Mechanical Engineers, Washington Section**

PEPCO Auditorium, 10th and E Sts., N.W.,  
8:00 p.m.

## BOARD OF MANAGERS MEETING NOTES

The Board of Managers held its 540th meeting on October 3 at the National Academy of Sciences, with President Abelson presiding.

The minutes of the 539th meeting were approved with minor corrections.

*Announcements.* Dr. Abelson announced appointment of John K. Taylor as chairman of the Committee on Encouragement of Science Talent, for the remainder of the Academy year, in place of Lloyd N. Ferguson; of Herbert L. Ley, Jr., to the Medical Sciences Panel, Membership Committee, through 1963, replacing Webb E. Haymaker; and of Norman Bekkedahl as chairman of the Committee on Awards for Scientific Achievement.

*Meetings Committee.* For Chairman Frenkiel, the secretary announced that at the October 19 general meeting, T. Dale Stewart of the Smithsonian Institution would speak on "The Last Phase of Human Evolution."

Dr. Abelson reported on progress in setting up the Institute on Isotopes and Radioactivity, planned for the first week of November. (See also story elsewhere in this issue.) Arrangements to permit attendance by Academy members as well as science teachers were under consideration.

*Membership Committee.* The secretary announced the names of eight new Academy members, elected pursuant to the Board's action at



its June meeting, as follows: Clyde S. Barnhart, Chester R. Benjamin, Francis J. Heyden, Ralph E. Lapp, Morris Lieberman, Robert M. Page, Vera C. Rubin, and James H. Trexler.

*Committee on Awards for Scientific Achievement.* Dr. Abelson urged that nominations for awards for scientific achievement, to be presented at the annual meeting of the Academy next January, be submitted to Dr. Bekkedahl as early as possible.

*Committee on Grants-in-aid.* Dr. McPherson announced a grant of \$100 to Carl Miller for a research project, pursuant to previous action by the Board. The Board approved another grant, in the amount of \$55, to Thomas G. Hoffman of Fairfax High School, for a project on ion exchange resins.

Dr. McPherson brought up a matter, discussed in the Policy and Planning Committee, concerning the use of funds that AAAS has been granting to WAS and other U.S. science academies for support of research. A letter from Dr. Abelson to AAAS was quoted, expressing the view that such funds granted to the Washington Academy should not be restricted to use by secondary school students, but should be applicable to both senior and junior scientists, in accordance with need and probability of effective use. Mr. Braaten brought up the point that AAAS funds might well be used to reimburse the Academy for the \$300 it gave for support of summer research by high school students under the mechanism developed by Dr. Schubert. Dr. McPherson indicated that he would obtain an opinion from AAAS on this question.

*Policy and Planning Committee.* Dr. Campbell discussed the background of an application made by the Washington Section of the Institute of Food Technology, for affiliation with the Academy. Dr. McPherson moved that the question of affiliation be placed on the ballot in the December elections, for approval by the membership. The motion was passed.

Dr. Campbell reported the Committee's recommendation that annual dues be raised to \$10 for resident members and \$7.50 for nonresident members. He reviewed the budgetary situation and pointed out that expenses for the current year were still exceeding income, despite the fact that the Academy's paid staff officer was released last March. He pointed out that the *Journal* was operating on as stringent a budget as could be expected, and that any expansion could be effected only at increased cost. He spoke, also, with regard to the matter of assistance to the officers, indicating that it was quite necessary that the time-honored system of relying on the elected officers to supply clerical and other assistance from their own offices be supplemented by central office activities. He pointed out that it was becoming

increasingly difficult to induce proposed nominees to accept nomination to office in the face of the very strenuous responsibilities which a number of these offices carry.

Dr. McPherson moved that the dues increase be put to a vote of the membership. After a general discussion, and a review of the financial situation by Mr. Braaten, the motion was unanimously passed and the secretary was instructed to include the question in the annual ballot.

*Committee on Encouragement of Science Talent.* Dr. Schubert summarized the contents of a comprehensive report that he had prepared, concerning the Committee's activities in connection with the program for summer research by high school students. Briefly, the program was an entire success. (See also the story, "Joint Board Sponsors Student Research Program," in the November *Journal*, page 117.)

*Committee on Science Education.* Dr. Taylor summarized recent activities of the Committee and the Joint Board on Science Education. He indicated that a meeting set up through Dr. Seeger in the early summer had resulted in a very successful discussion between about 50 representatives of five different academies of this area. (See also the story, "WAS Holds Inter-academy Education Conference," in the November *Journal*, page 119.) It was his feeling that the Academy and the Joint Board were leading the country in science education efforts, and that the other state academies were looking to us for guidance in this field. He reported that the budget for the year had been cut considerably, amounting to \$26,725. Since on October 16 there would be a deadline for re-application for funds from NSF, it was planned to apply for only \$10,000 for the coming year and to omit certain items of school support which had swelled the budget of prior requests. He felt, however, that it was also necessary to request that *The Reporter*, previously supported by a grant from the Meyer Foundation now be funded through NSF. He requested that NSF be asked to permit diversion of present funds to recover the current expenses of the magazine; the Board approved this request.

*Special Committee for Directory.* Dr. Campbell stated that, at Dr. Abelson's request, he had recommended the appointment of R. W. Krauss of the University of Maryland as chairman of a special committee to investigate the feasibility of preparing a joint directory of the membership of the Academy and affiliated societies.

*Nominations.* After the Board had adjourned, the delegates of the affiliated societies remained to act as a Nominating Committee, under the chairmanship of the senior delegate, Lawson McKenzie of the Philosophical Society, to draw up a slate of officers for 1962.

## JOINT BOARD ON SCIENCE EDUCATION

At its October meeting, the Joint Board set its sights high and voted to aim at a record budget of \$14,375 to operate its program during the 1961-62 school year. This includes a *normal budget* of \$12,575 and a *supplemental budget* of \$1,800 to provide for its planned programs.

The summer training program, science fairs, and publication of *The Reporter* are the major items in the budget with \$4,000, \$3,325, and \$2,500 being allotted respectively for these activities. The school contacts program was allotted \$1,000, while \$750 was budgeted for science teacher awards. The Committee on Women in Science received a budget of \$250, while the Frontiers in Science lectures account for \$150. Various administrative expenses account for \$225.

The supplemental budget would provide \$1,000 to expand and improve the summer training program, and \$800 to permit sending a full quota of representatives to the National Science Fair.

The Board's income includes \$6,500 from grants to finance the summer training program and publication of *The Reporter*. Professional societies and industrial organizations, as in the past, are expected to contribute some \$5,200. Sale of project books and other sources of revenue are expected to amount to another \$875. This leaves a balance of \$1,800 that must be obtained from other sources if program goals are to be fully realized.

Part of the increased budget is due to the fact that the science fair will be held on the Pacific coast. The larger portion is the result of *more services* being rendered to *more people*. It is hoped that regular contributors will be as generous as possible, and that new donors will join their ranks to insure the success of the JBSE's 1961-62 program.

The book, "Project Ideas for Young Scientists," published by the Joint Board in October 1960, has exhausted its first printing of 3,000 copies. This 140-page book contains more than 400 investigative-type projects suggested by local scientists as applicable to the secondary school level. It has received very favorable reviews and has been distributed nationally. In fact, some 100 copies have been sent to various international purchasers.

In view of continuing orders, the Board approved a second printing of 1,000 copies of the book. Meanwhile, plans are being made to prepare a revised and enlarged edition for publication probably in the fall of 1962. Members of the Academy interested in contributing to the new edition are invited to contact the editor, John K. Taylor, National Bureau of Standards,

Washington 25, D.C., for further details.

The series of conferences on the teaching of science and mathematics in secondary schools is in full swing. An inter-academy conference (reported in the November number of the *Journal*), and conferences concerned with biology, physics, and general science (Northern Virginia area) have already been held. In addition, plans have been made for the following conferences: Chemistry—January 20; General Science (D.C. area)—February 17; General Science (Maryland area)—March 10; Women in Science—March 31; Mathematics—April 14; Elementary School Science—early May.

A special conference devoted to career counseling in engineering is being planned for January 6.

Invitations to attend these all-day meetings are issued to those known to be interested in science education. The Joint Board is always glad to add new names to its list and would be glad to know of those who would like to attend any of the conferences mentioned. Invitations will be extended insofar as possible.

## WASHINGTON JUNIOR ACADEMY OF SCIENCES

The Washington Junior Academy of Sciences will hold its annual convention at the Hamilton Hotel on December 28, from 9:30 a.m. to 4 p.m. Several hundred members and other students are expected to attend to hear papers presented by some 40 students on various subjects in science and mathematics.

The convention will consist of four concurrent morning and afternoon sessions in the fields of biology, chemistry, mathematics, and physics, devoted to student papers. A luncheon, for all attendees, will be partially subsidized by the WJAS to encourage a large attendance.

The Junior Academy is also planning a workshop for science club officials to be held early in January. Originally scheduled for November, it was postponed because of several conflicts that would have prevented a large attendance. The conference, patterned after the very successful one held during December 1960, will be concerned with various activities carried on by the clubs, as well as consideration of ways in which club programs can be strengthened. A speaker from the Joint Board will be present to discuss ways in which it can help science clubs.

## SCIENCE AND DEVELOPMENT

A handy gadget that will make enough fresh water to keep survivors of sea disasters from dying of thirst has been developed by the Army Engineer Research and Development Laboratories at Fort Belvoir. It oper-

ates with heat from the sun's rays or from the body of an individual sitting on it. It consists of a sheaf of five sheets about the size of standard typewriter paper. Each sheet is made up of a black plastic film on top, piece of paper toweling or cloth, then a water-repellent screen, a sheet of aluminum foil and a cloth backing for the foil. A sponge to collect the fresh water completes the kit. The sheets are dipped in the ocean, excess water is drained and the aluminum foil wiped dry. The sheets are reassembled with the black plastic film on top and exposed to the sun or body heat. The heat penetrates the aluminum foil which is cooled by the bottom saltwater soaked cloth. Fresh water condenses on the foil. The survivor uses the sponge to soak up the water. There may be only a few drops, but enough to keep a person alive.

**American University has set up a cancer research laboratory at Sibley Memorial Hospital.** The laboratory was established under an \$85,000 grant from the National Cancer Institute. Research will be conducted with pregnant mice to determine why fetuses and tumors of fetal origin are not rejected by the mother as would be other foreign "skin grafts." If tolerance to foreign substances can be induced or destroyed at will, the findings could be applied to many medical problems including leukemia, pregnancy diseases, replacement of defective tissues and organs, and fetal-originated tumors.

**A new class of non-magnetic alloys that are corrosion resistant and have almost the hardness of tool steel has been developed at the Naval Ordnance Laboratory.** The new alloys are intermetallic compounds formed by a combination of titanium and nickel, and have been named Nitinol. The alloys are strong and tough, having been tested up to 43 foot-pounds impact strength. The toughness increases as temperature decreases, yet the alloys are suitable for use up to about 1200°F. The specific gravity of 6.45 means that the alloys offer strength without adding weight, and are useful for aircraft, tools,

and other applications. Nitinol has a very high mechanical vibration capacity at room temperature, which decreases rapidly as temperature is increased. This characteristic may make it useful in temperature-sensing devices.

**A tidal current survey is being made in the Potomac between the South Capitol Street Bridge and Dahlgren, Va.** The survey is being made by the Survey Ship *Mariner* of the Coast and Geodetic Survey. Results of the survey will furnish mariners with up-to-date information on the direction and velocity of the currents under certain bridges, at river turns, and at narrow stretches where changes in the velocity have been known to exist. The information will be incorporated into the C&GS Tidal Current Tables. These tables enable pilots of tugs and seagoing vessels to navigate more safely, and are used in planning bridge construction, dredging operations and other projects.

**The Department of Interior announced on September 22 that a geological survey of potential ground water supplies of Washington, D.C., and adjacent areas has been completed.** The report has been placed in the files and is available for public examination. While the major requirements of the area are met by surface water considerable ground water is used in fringe areas not reached by city supplies. Ground water throughout the study area is generally satisfactory for domestic and industrial use but in some places, excessive iron and corrosiveness are problems.

**A direct and rapid test for nutritive value of feeds has been developed by the Department of Agriculture.** The test measures and defines the parts of livestock feed that provide body energy and growth. The new test takes only about five hours, whereas the old method required about two days. The new method may indicate the nutritive value of feeds in terms of meat or milk production. It also may be useful for gauging the loss of nutrients in feeds heated excessively during drying.

## Delegates for 1961 to the Washington Academy of Sciences, Representing the Local Affiliated Societies

Philosophical Society of Washington .....	LAWSON M. MCKENZIE
Anthropological Society of Washington .....	REGINA FLANNERY HERZFELD
Biological Society of Washington .....	HERBERT FRIEDMANN
Chemical Society of Washington .....	JOHN L. TORGESEN
Entomological Society of Washington .....	WILLIAM E. BICKLEY
National Geographic Society .....	ALEXANDER WETMORE
Geological Society of Washington .....	MARGARET D. FOSTER
Medical Society of the District of Columbia .....	FREDERICK O. COE
Columbia Historical Society .....	U. S. GRANT, III
Botanical Society of Washington .....	HAROLD T. COOK
Society of American Foresters .....	HARRY A. FOWELLS
Washington Society of Engineers .....	HOWARD S. RAPPLEYE
American Institute of Electrical Engineers .....	WILLIAM A. GEYGER
American Society of Mechanical Engineers .....	WILLIAM G. ALLEN
Helminthological Society of Washington .....	DOYS A. SHORB
Society of American Bacteriologists .....	MARY LOUISE ROBBINS
Institute of Radio Engineers .....	ROBERT D. HUNTOON
American Society of Civil Engineers .....	JOSEPH M. CALDWELL
Society for Experimental Biology and Medicine .....	KATHRYN KNOWLTON
American Society for Metals .....	JOHN A. BENNETT
International Association for Dental Research .....	GERHARD BRAUER
Institute of the Aerospace Sciences .....	FRANCOIS N. FRENKIEL
American Meteorological Society .....	JACK THOMPSON
Insecticide Society of Washington .....	MILTON S. SCHECHTER
Acoustical Society of America .....	RICHARD K. COOK
American Nuclear Society .....	URNER LIDDEL

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